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ABSTRACT

This preliminary planning study undertakes to develop a detailed picture of what the National Institute of Education might become. It addresses five major categories of questions concerning the proposed Institute: (1) its objectives, (2) program, (3) organization, (4) relationship with the educational system, and (5) initial activities. This report attempts to provide a coherent, reasonably detailed set of answers to these categories of questions. It conveys a picture of the NIE derived from discussions and meetings with a wide range of individuals from government, education, and the research and development community, and from examination of prior studies of the organization of R&D institutions. The purpose of this report is to present a sufficiently detailed picture of initial activities of NIE to be helpful to those concerned with the Institute's creation. Planning for the NIE is and must be a continuing process. This plan which is truly preliminary should be viewed by the reader as part of a continuing evolution. A bibliography listing the major published sources consulted during this study is included. (ON)

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NATIONAL INSTITUTE OF EDUCATION: PRELIMINARY PLAN FOR THE PROPOSED INSTITUTE

Roger E. Levien, Study Director

A Report prepared for

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

Rand
SANTA MONICA, CA. 90406

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PREFACE

This report presents the findings of a preliminary planning study for the proposed National Institute of Education. It conveys a picture of the NIE derived from discussions and meetings with a wide range of individuals from government, education, and the research and development (R&D) community, and from examination of prior studies of the organization of R&D institutions. The report has benefited considerably from the suggestions and comments of the many individuals from government, education, and R&D who examined it in draft form. The purpose of this report is to present a sufficiently detailed picture of the possible objectives, program, organization, network of relationships, and initial activities of the NIE to permit careful review by those concerned with the Institute's creation.

Planning for the NIE is and must be a continuing process. Its first stage produced the concept described in President Nixon's *Message on Education Reform* of March 3, 1970, and the NIE Bill introduced in the Congress at that time. This study was the second stage. Subsequent stages will occur during the Congressional hearings on the NIE Bill and after the Institute's formation and will continue as long as it retains the capacity to renew itself as circumstances change. This plan, then, is truly preliminary; it should be viewed as part of a continuing evolution.

Among the subjects that must be addressed during the next stage in planning are details of staff, budget, and program for the NIE. For an enterprise with so large a prospective scope as educational R&D and so small a current effort, budget and staff depend not so much on the identifiable need as on the practical availability of personnel and financial resources. Determination of that availability depends, in turn, on a careful effort to develop a program for the NIE that identifies what can be done and how much it might cost. Thus, a central focus of the next stage in planning must be an extensive effort to develop such an *Agenda for Educational Research and Development.*

Please read this report carefully and consider the National Institute of Education it portrays. What has been left out? What has been included that should not be? How might the proposed Institute be improved?

SUMMARY

In his *Message on Education Reform*, 3 March 1970, President Nixon proposed creation of a National Institute of Education to serve as "a focus for educational research and experimentation in the United States. At the same time, bills were introduced in the Congress to authorize an NIE with the following characteristics:

Purpose. To *conduct* and *support* educational R&D, disseminate its findings, train educational R&D personnel, and promote coordination of educational R&D within the Federal government.

Location. A *separate agency*, equivalent to the Office of Education in status, within the Department of HEW.

Director. Appointed by the President, with Senate confirmation, to an *Executive Level V* position (equivalent to Commissioner of Education at present).

Advisory Council. A 15-member *National Advisory Council on Educational R&D* would advise on matters of general policy and review the state of educational R&D.

Personnel. Professional personnel could be appointed *without regard to the Civil Service System* as deemed necessary by the Secretary of HEW.

Funds. Funds appropriated would remain available until expended.

The pending legislation leaves unanswered a wide range of questions concerning the NIE. This planning study was undertaken to develop a more detailed picture of what the NIE might become. Five major categories of questions concerning the proposed Institute were addressed: its objectives, program, organization, relationship with the educational system, and initial activities. This report attempts to provide a coherent, reasonably detailed set of answers to those categories of questions.

WHAT WOULD THE NIE'S OBJECTIVES BE?

The *primary objective* of the NIE would be:

- *To improve and reform education through research and development.*

Improvement and reform of three specific kinds would be sought: increased equality of educational opportunity, higher quality of education, and more effective use of educational resources. Education in all settings, both within schools and outside of them, and of all Americans, before, during, and after the traditional school ages, would be within the NIE's scope of interest. And all kinds of R&D activity, from basic research to large field tests and demonstrations, would be in its repertoire.

To attain this primary objective, the NIE would undertake efforts directed toward four specific *supporting objectives:*

I. *To help solve or alleviate the problems and achieve the objectives of American education.*

II. *To advance the practice of education as an art, science, and profession.*

III. *To strengthen the scientific and technological foundations on which education rests.*

IV. *To build a vigorous and effective educational research and development system.*

WHAT WOULD THE NIE'S PROGRAM BE?

The design of the research program would follow from the NIE's objectives. Associated with each supporting objective would be a major *program area* of the Institute:

- *Program Area I: Solution of Major Educational Problems*
- *Program Area II: Advancing Educational Practice*
- *Program Area III: Strengthening Education's Foundations*
- *Program Area IV: Strengthening the Research and Development System*

These program areas would be divided, in turn, into several *program elements*. The number and definition of the program elements in an area

might change over time as priorities and competencies change. The program elements would comprise, in turn, a cluster of *program activities.* These would ordinarily be individual projects or groups of closely related projects. (A tentative listing of prospective program activities appears on pp. 61 - 97.)

The four program areas would differ in the priority and support assigned to each, in the criteria and methods for program design, and in the range of R&D activities involved. They would require different internal organizational structures for their appropriate management.

WHAT WOULD THE NIE'S ORGANIZATION BE?

The NIE would be

- A *separate agency* within HEW,
- *Parallel* to the OE,
- *Reporting to the Secretary of HEW* through his designee, and
- Led by a *Director* at Executive Level V, like the Commissioner of Education at present.

Its administration would be provided by

- The *National Advisory Council on Educational Research and Development,* which would assist in setting general policy, and
- The *Director,* who would be responsible for continuous administration of the Institute's policies and programs.

The internal structure of the Institute would correspond to the structure of its programs. It would comprise

- A *Directorate of Programs,* headed by an Assistant Director for Programs, responsible for development and management of comprehensive national programs that address major educational problems (Program Area I),
- A *Directorate of Research and Development,* headed by an Assistant Director for Research and Development, responsible for development and support of coherent, cumulative efforts to strengthen educational practice, the foundations of education, and the educational R&D system (Program Areas II, III, IV),

- o A *Center for Educational Studies*, headed by an Assistant Director for Studies, responsible for conduct of a program of studies of the state of education, analyses of educational problems, and design and evaluation of R&D programs (Intramural Studies), and
- o The usual *staff functions* for administration and communication.

HOW WOULD THE NIE FUNCTION?

The NIE's functioning may be best described in terms of its four major program areas and its intramural program.

Program Area I: Alleviating Major Educatio l Problems

The first priority of the NIE would be to organize, support, and carry out *comprehensive national programs* (combining research, development, experimentation, evaluation, and implementation activities) attacking major educational problems. It would devote a major portion of its resources--on the order of 50 percent--to this program area.

Illumination of the nature of education's crucial problems would be a major function of the NIE; the intramural R&D activity would play a central role in this process. However, that illumination has not yet been performed, so an adequate definition of problems warranting national R&D efforts does not exist. Thus, the following exemplars of problems to be addressed must be viewed as preliminary and tentative:

- o The poor education received by the disadvantaged,
- o The inadequate quality of the education received even by those from more comfortable backgrounds, and
- o The need to use education's limited resources more effectively.

Certainly, these problems would have to be narrowed and sharpened before comprehensive R&D programs addressing them could be developed.

To help solve these major educational problems the NIE would want to do two things: first, bring to bear in a coordinated way all that is already known or developed that might help in resolving the problem; and second, focus careful effort on learning and developing what is needed to provide better solutions.

Central management of each program element would be provided by an NIE *program task force*, led by a *program manager* and advised by an *advisory panel* of educators, R&D personnel, and laymen. The staff of the task force would comprise not only permanent problem-oriented R&D management personnel, but also personnel seconded from those parts of the NIE concerned with support of work on educational practice and foundations. They would bring to the problem task forces an awareness of the state of the art in their areas of concern, and would take back to those areas an enhanced appreciation of the needs of the educational system.

Program Area II: Advancing Educational Practice

The NIE would commit a significant portion of its resources--up to 25 percent--to *continuing, cumulative programs* intended to advance the practice of education in its artistic, scientific, and professional aspects. These programs would attempt to do those things that offer the best hope of moving the state of the art forward. The activities would be carried out in many settings, would be less tightly linked together than the components of a problem-focused program element, and would provide both near- and farther-term returns.

This area would be concerned with the instructional process (content and methods), the educational system (forms of education and their administration), educational assessment, and the education of educational personnel.

Management would reside in a *Division of Educational Practice* within the Directorate of R&D. Because of the continuing nature of these concerns, each one could be the responsibility of a separate *National Center*, led by a *Center Director*, and advised by a *Center Advisory Group* drawn from those distinguished educators and scholars with a direct interest and competence in the Center's area of concern.

The staff would comprise both permanent members and a number of educators or scholars serving temporary tours. To facilitate the exchange of information between problem-oriented and practice-oriented R&D, Center staff members would serve--part-time--on problem task forces.

Program Area III: Strengthening Education's Foundations

The NIE would invest a stable proportion of its resources--perhaps 10 to 15 percent--in a *portfolio of programs* intended to strengthen educational foundations in the sciences and technologies.

Educational practice and the solution of educational problems are rooted in an understanding of the *individual* as a learner, *group processes* and how they affect learning, *society* and its relation to learning, and the *technology and media* useful in instruction. These would be the central concerns of this area.

Management responsibility would reside in a *Division of Educational Foundations* within the Directorate of R&D. Each subject of concern would be associated with a *Program of Studies*, headed by a *Program Director*, and relying heavily on *Review Panels* drawn from the scientific community for assistance in program development.

Staff would be both permenent and short-term. Many of them would serve part-time, on problem-oriented task forces.

Program Area IV: Strengthening the R&D System

The NIE would devote a portion of its resources--say 10 to 15 percent--directly to the development of the R&D performer community through fellowships, institutional grants, and similar mechanisms.

Among the constituents to which it might want to devote attention are R&D manpower, R&D institutions, the linkages between R&D and practice, and information transfer within the R&D system.

Management responsibility for this area would reside in a *Division of R&D Resources* within the Directorate of R&D. Each constituent would be the responsibility of a *Program*, headed by a *Program Director*. The program professional staff would comprise permanent members primarily. Care must be taken to coordinate these programs with those of other parts of the NIE so that manpower and institutional programs respond to actual needs.

Intramural Program--Center for Education Studies

The NIE would devote a small portion of its resources--say 5

percent--to an intramural R&D program that would undertake careful study of educational problems, practices, and R&D. The intramural program would bring together permanent staff and a large number of 6-month to 2-year visitors from the education and R&D communities and others with a deep interest in education.

Management would be provided by a *Center for Education Studies*. The internal organization of the Center would not be so formal as that of the Directorates. The basic unit of activity would be the *project*, each led by a *project leader* and varying in intensity from one man part-time to a dozen or more men full-time. An *Education Studies Board* would advise on the selection of visiting staff and on the program of studies.

Temporary staff would be drawn from other Directorates of the NIE, other Federal agencies, Fellows--both junior and senior--who come full-time for a fixed period, and Associate Fellows--both junior and senior--who are associated with the Center part-time for a fixed period.

Major themes of work at the Center would include illumination of major educational problems, evaluation of educational evaluations, examination of educational goals, evaluation of educational policies, and review of the state of educational R&D.

ACKNOWLEDGMENTS

The preliminary plan for the NIE that appears in this report owes much to the suggestions and comments of the many people consulted during the study effort. Their ideas have been adopted, sometimes modified, merged, and occasionally extended to produce the NIE plan presented here. It has been impossible to acknowledge the contributions of each individual. Instead, their names have been listed in Appendix C, although the major contributions of several are inadequately conveyed by that listing. A draft of this report was distributed to over 450 people in the government, education, and R&D communities. More than 150 letters of comment were received in return. The names of those who replied also appear in Appendix C. The report has been greatly improved as a result of their comments.

Throughout the study, two members of the Planning Study staff, John Wirt and David Mundel, have been of considerable assistance. Both prepared early drafts of material that appears in this report. John Wirt is the author of Appendixes E, F, and G. David Mundel assisted in developing the program elements. The report has also benefited greatly from the assistance and comments of John Mays of the Office of Science and Technology, Executive Office of the President.

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I. INTRODUCTION

WHY A NATIONAL INSTITUTE OF EDUCATION?

American education faces severe problems. Despite a proud record of achievement in expanding educational opportunity, symbolized by the enrollment of half the college-age population in higher educational institutions, grave difficulties remain.

The expansion of educational opportunity has occurred unequally, bypassing many children born into social or economic disadvantage. Even the more privileged too often find education at all levels joyless, inappropriate, or ineffective. Educational institutions, from school districts to universities, face severe financial crises. Yet, even where sufficient resources are available, too little is known to assure their effective use. Many schools and campuses suffer the disruption of learning by individual and group acts of violence. Partially as a consequence, there are conflicting pressures throughout the education system to redistribute the powers of educational governance. Clientele currently ill-served by the formal educational system are demanding their full share of its attention. At the same time, television and other powerful nonschool sources of education are rarely turned to the effective service of any educational clientele. The problems are severe indeed.

But the aspirations are high as well; Americans continue to expect much from their educational system. It should convey to members of the coming generation the knowledge and values of the previous one; develop in them the capacity to increase knowledge and strengthen values; and inspire among them the will to use that knowledge in the service of their values. It should prepare its students to adapt to life half a century into the future, in an age when fifty years spans several technological and social millenia, and offer them the opportunity to renew their skills and themselves throughout their lives. It should equip its graduates to be effective contributors to society, to be intelligent consumers, to be wise voters, and to be understanding parents. And it should do all this for children of poverty and neglect, as well as for those of comfort and care, while the vocational needs of the

economy are changing, society's structure and values are shifting, technology and science are reshaping the physical world, and the fund of knowledge to be conveyed is building at an ever-expanding rate. The aspirations are high indeed.

To alleviate its problems and achieve its aspirations, *American education, at all levels and in all forms, must undertake a continuous program of improvement and reform.*

How Can Improvement and Reform Be Achieved?

Improvement and reform of American education requires efforts of many kinds: new forms of education must be designed, personnel must be better trained and selected, institutions must be reshaped, curricula must be revised, instruction must be refined. But there are many impediments to these efforts. In some cases, desirable change is impeded by lack of funds. In some cases, tradition or institutional inertia blocks the way. In still other cases, there is no one to catalyze the necessary change. But in a great many cases, there is simply not enough known to point the way to desirable change: we do not know enough about how to design new forms of education; train and select educational personnel more effectively; reshape institutions so that they become more flexible and responsive; develop and introduce contemporary curricula into the schools; or make instruction at all levels more personal and adaptive. Nor do we know enough about how to obtain the funds essential to change; overcome resistance to useful change; develop agents of change; or provide the best current knowledge to those who need it to bring about change. *Lack of knowledge is a major impediment to achieving improvement and reform of American education.*

Knowledge may be acquired in two ways: it may be the result of the random and casual process through which most institutions and individuals learn from their experiences--trial and error; or it may be a product of the interrelated and disciplined procedures by which scholars, scientists, and technologists gain information and use it--research and development. R&D has greatly expanded our knowledge of physical and biological phenomena and our ability to adapt those phenomena to our purposes. While random and casual processes of learning about education

will continue, they are insufficient. *Educational R&D is necessary to gain the knowledge needed for educational improvement and reform.*

What Can Educational R&D Provide?

Educational R&D cannot be expected to provide miracles or instant solutions. Its foundations in the behavioral and social sciences are still weak compared to the support that the physical and biological sciences provide health, agricultural, and industrial R&D. Moreover, educational processes and problems are extraordinarily complex and unyielding to simple study. Consequently, the time required to comprehend an educational process or develop a product is years, sometimes decades. Nevertheless, educational R&D can be expected to provide assistance and continuing improvement to educational practice. Certainly, the best of current knowledge and its applications must and can be made available for use in the schools and in other educational situations. And equally certainly, the fund of knowledge and its useful applications must grow at a rate consonant with the needs of education.

While educational R&D is unlikely to produce a learning pill or a motivating potion, it can produce important improvements and point the direction to reform. Here are some examples, from among many, of what a vigorous and effective R&D system could reasonably be expected to provide:

- o A continuously growing understanding of the educational process, which over the course of years changes the way we think about and conduct education (for example, an unraveling of the biological bases of memory that suggest new modes of learning and teaching).
- o Contemporary, interesting curricula, continually renewed, in most fields of learning (for example, development of a curriculum that draws upon literature, drama, and film to enrich the students' comprehension of what is unique in human affairs: individual lives, individual events, and individual relationships).
- o An expanding variety of forms of education designed to provide many more individuals with educational opportunities adapted to

their needs and life-styles (for example, design of postsecondary education that extends through an individual's lifetime; is not tied to particular institutions, places, or degree structures; and serves both career and personal needs).

- o Objective information about the strengths and weaknesses of American education (for example, a description of the extent and nature of disorder in schools and on campuses, analysis of its likely causes, and examination of the effectiveness of the programs that have been tried to prevent it).
- o Better understanding of the prospective benefits and costs of Federal, state, and local educational policies before decisions are made (for example, data-based estimates of the prospective impact of possible forms of Federal aid to higher education on each of higher education's principal goals, categories of institution, and groups of students).
- o Plans for comprehensive educational programs, combining institutional, personnel, curricular, and instructional changes, carefully developed to meet major educational needs (for example, design and evaluation of a system of urban education extending from preschool through adult education that employs community television, storefront learning centers, and local tutors to provide each resident with education adapted to his needs).

While these examples indicate what educational R&D can provide, they are only a small sample. Adequately supported, R&D can, over time, help to improve every aspect of American education, in schools and out. *The investment in building a strong educational R&D system will be repaid many times over in benefits to American education.*

Why Have the Potential Benefits of Educational R&D Not Been Achieved?

Of course, some investment in educational R&D has already been made. Research on American education has been under way since the 1890s, when Joseph Meyer Rice tried to relate the practices of teachers to their students' performance. However, significant national investment did not begin until the mid-1950s, when first the National Science Foundation and then the Office of Education began to fund curriculum development

and a wide range of research activities. Nevertheless, the sums provided have been relatively small. Even now educational R&D receives only slightly more than $200 million annually and occupies the talents of fewer than 10,000 R&D personnel. This is tiny compared to the size of the educational enterprise, which contributes over $70 billion to the GNP, employs over 3 million personnel, and engages about 60 million students. The investment in R&D is only 0.3 percent of operational expenditures in education.

Health and agriculture, which each contribute about as much as education to the GNP, invest considerably more in R&D than does education. In health, the annual R&D expenditure from all sources is almost $2.5 billion--4.6 percent of the nation's total expenditures on health care. In agriculture, the annual R&D expenditure is over $800 million; that is, slightly over 1 percent of agriculture's contribution to the GNP. Moreover, if education were ranked among the major industries according to R&D expenditures, it would stand in thirteenth place, just below the stone, clay, and glass products industry, and far below the $5.6 billion R&D program of the aircraft industry or the $4.2 billion R&D program of the electrical equipment industry.[1]

Of course, the comparison with health, agriculture, and industry cannot be used by itself to demonstrate the need for more funds for educational R&D. Educational R&D is not as fortunate as those areas with regard to the solidity of its scientific base, the demand for and acceptance of innovation by its users, or the ability to measure and display improvement. Nevertheless, the comparison is valuable because it indicates the scale and cost of reasonably successful R&D activities in other major enterprises of no greater complexity or challenge than education. If the current record of educational R&D is to be judged, as it often is, in comparison with the well-known successes of health, agricultural, or industrial R&D, then the difference in size must be weighed in the judgment. It is useful to remember that since 1950 over $14 billion has been invested in health R&D by the Federal government

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[1]Figures for industrial R&D come from *Industrial Research*, January 1971, pp. 36-38.

alone, over $7 billion has been invested in agricultural R&D, but less than $1 billion has been invested in educational R&D.

Against this background, the inability of current educational R&D to satisfy the needs of education for knowledge to guide improvement and reform becomes understandable: the educational R&D system is very likely too small. However, its smallness has been exacerbated by other difficulties. The reputation of educational R&D has been relatively low; individuals of the competence (on the average) found in industrial or health R&D have not often enough been attracted to work on the problems of education. The scientific base of educational R&D has been narrow; psychology has provided most of the basic concepts and techniques. The focus of educational R&D has been diffuse; small projects asking small questions with small cumulative effect have predominated. The linkage between educational R&D and the education system has been weak; little output of R&D has found its way to the classroom and not many classroom problems have been solved through R&D. Teachers and administrators have been too rarely involved in the quest for new educational knowledge and its use. Finally, the support for educational R&D has been unstable; rapid changes of staff and priorities in Federal agencies have caused frequent fluctuations of emphasis.

Thus, *if the potential benefits of educational R&D are to be achieved, the educational R&D system must be strengthened.*

How Can Educational R&D Be Strengthened?

Building a vigorous and effective educational R&D system, capable of supporting the improvement and reform of American education, will require action to overcome each of the difficulties cited earlier. Improvement must occur with respect to six major characteristics of educational R&D.

1. *Size*. The national investment in educational R&D must grow to a size consistent with educational needs. (A preliminary target might be 1 percent of total educational expenditures.) The rate of growth, however, will necessarily be determined by the R&D system's capacity to develop competent personnel, effective institutions, and programs of high quality and value.

2. *Stature*. The place of educational R&D in government and in public and professional respect must be raised to a level comparable to that of other major national R&D enterprises. The rise in position within government is the more easily achieved; however, if it is accompanied by other improvements, it is likely to contribute as well to the rise in public and professional respect. Both effects will enhance the attractiveness of educational R&D to the competent professionals whose contributions will, in the end, determine the real stature of educational R&D.
3. *Personnel*. Educational R&D must engage the efforts of highly qualified personnel from a wide range of intellectual backgrounds. Ways must be found to conjoin their diverse knowledge and skills in investigations of educational phenomena and development of educational products.
4. *Focus*. The efforts of the educational R&D community must be linked into activities of critical size that address issues of high scientific or practical consequence. Areas for focused effort, however, should be determined by careful analysis and consultation with advisory groups representing the appropriate constituencies.
5. *Implementation*. The educational R&D and operating communities must be linked more closely if the products of R&D are to serve the real needs of education and be implemented. This is by far the most critical problem of educational R&D and should be the subject of extensive and varied efforts; without improvement in this area, all else will eventually fail.
6. *Stability*. Educational R&D must develop and maintain multiyear cumulative programs that address critical educational issues.

The action to overcome these difficulties, however, cannot be taken by the educational R&D community alone. It must be encouraged and facilitated by the major influence on educational R&D, its principal source of funds--the Federal government.

Over 85 percent of educational R&D funds are provided by the Federal government. How much Federal money is spent, how well, where, and

for what, strongly affect the direction and quality of educational R&D. Thus, *strengthening educational R&D must begin with the strengthening of Federal support and leadership.*

How Can Federal Support and Leadership Be Strengthened?

Two things are necessary to achieve strong Federal leadership and support of educational R&D: wise management and sufficient funds. But as a practical matter, neither wise managers nor sufficient resources can be attracted and employed to best effect in the absence of the proper institutional framework. Thus, the characteristics of the principal Federal agency supporting educational R&D are of central importance. To strengthen educational R&D will require an agency with the following characteristics:

- *Position within the government comparable to that of such agencies as the National Institutes of Health, National Bureau of Standards, and National Science Foundation.* This position is necessary if it is to achieve leadership among the several Federal agencies that support educational R&D and if it is to provide a strong voice for increased support of educational R&D within the Executive Branch and before Congress. Heightened institutional position and visibility would also have the effect of raising the stature of educational R&D among the public, the educational community, and the R&D community.
- *An active advisory council, broadly representative of the education and R&D communities and the public, to help the agency develop its policies and programs.* The council would help to assure that the Federal government's support of educational R&D activities reflects the needs and has the support of the several constituencies. It would also advise on the choice of areas of focus and help maintain stable support for multiyear programs.
- *An internal R&D activity, of high competence, concerned with illuminating the major issues facing American education and identifying promising directions for educational R&D.* The internal R&D activity would conduct the analyses the agency will

need in order to define appropriate areas in which to focus resources. It would also be the site for interdisciplinary studies by teams comprising both permanent staff and short-term visitors from education and R&D organizations. The existence of high-quality internal research would establish a climate of intellectual challenge and concern for education that should help to attract first-class R&D personnel to the agency, both for internal research and for the management of external research.

- o *A flexible personnel system, modeled on those in other Federal R&D agencies, such as the NSF and NIH.* The personnel system should enable it to hire competent staff from many disciplines and backgrounds in competition with universities, industry, and other R&D agencies and to provide short-term positions--as Fellows--for those who plan to spend most of their careers in other settings.
- o *Authority, similar to that held by other Federal R&D agencies, to carry over unexpended funds from one year to the next.* The funding authority would permit it to provide stable funding for multiyear R&D programs.

The principal agency for Federal support and leadership of educational R&D at present is the National Center for Educational Research and Development (NCERD) within the Office of Education. As currently authorized and constituted, it has none of these characteristics. *Thus, the conviction has developed in recent years that the best way to strengthen Federal support and leadership for educational R&D is to supplant NCERD with an agency having the necessary characteristics.* The result has been the proposal for creation of a *National Institute of Education.*

THE PROPOSAL TO CREATE THE NIE

The President proposed creation of the National Institute of Education in his *Message on Education Reform* of 3 March 1970. He described it as "a focus for educational research and experimentation in the United States. When fully developed, the Institute would be an important element in the nation's educational system, overseeing the annual expenditure

of as much as a quarter of a billion dollars."[2] At the same time, the Department of Health, Education and Welfare submitted legislation to authorize creation of the NIE.

The President's proposal culminated a sequence of related recommendations that began over a decade ago. In 1958 an advisory board organized by the National Academy of Sciences-National Research Council (NAS-NRC) proposed such an institute,[3] to be comparable to the National Institute of Mental Health. The advisory board elaborated the proposal later in the year.[4] It called for the establishment of an Organization for Research in Education to conduct and sponsor educational research. But the proposals "fell on deaf ears."[5] Several years later, in 1964, enlarged Federal support for educational R&D and "new institutional arrangements...for the initiation and management of new research programs and for the dissemination of results" were urged in a report of the Panel on Educational Research and Development of the President's Science Advisory Committee.[6]

More recently, Dean David Krathwohl, of the School of Education at Syracuse University, proposed the development of National Institutes of Education on the model of the NIH.[7] The same suggestion became one of the major recommendations made in the 1969 report of the *Commission on*

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[2]*Message on Education Reform*, President Richard M. Nixon, March 3, 1970.

[3]*Psychological Research in Education*, Advisory Board on Education, National Academy of Sciences-National Research Council, Washington, D.C., 1958.

[4]*A Proposed Organization for Research in Education*, Advisory Board on Education, National Academy of Sciences-National Research Council, Washington, D.C., 1958.

[5]Cronbach, L. J., and Suppes, P. (eds.), *Research for Tomorrow's Schools*, The Macmillan Company, New York, 1969, p. 10.

[6]*Innovation and Experiment in Education*, Report of the Panel on Educational Research and Development of the President's Science Advisory Committee, U.S. Government Printing Office, Washington, D. C., 1964.

[7]Krathwohl, D. R., *Educational Research: Perspective, Prognosis and Proposal*, Presidential Address, American Educational Research Association, Los Angeles, February 6, 1969.

Instructional Technology,[8] chaired by former Commissioner of Education Sterling McMurrin. Because they respond to the same set of circumstances that led the Administration to propose creation of the NIE, these two proposals deserve careful examination. They are reviewed in Appendix A.

The President's Message on Education Reform

The President's Message on Education Reform describes the *need* for a national agency concerned with educational research and experimentation; provides information about the *nature* of the proposed Institute; and indicates six *topics* to which the Institute would be expected to turn its attention.

Need. "As a first step toward reform, we need a coherent approach to research and experimentation. Local schools need an objective national body to evaluate new departures in teaching that are being conducted here and abroad and a means of disseminating information about projects that show promise."

"The purpose of the National Institute of Education would be to begin the serious, systematic search for new knowledge needed to make educational opportunity truly equal."

Nature. While the proposed legislation contains the basic description of the Institute, the President's Message provides some additional information about its nature:

- o "The National Institute of Education would be located...under the Assistant Secretary for Education."
- o It would have a "permanent staff of outstanding scholars from such disciplines as psychology, biology and the social sciences, as well as education."
- o "While it would conduct basic and applied educational research itself, the National Institute of Education would conduct a

[8] *To Improve Learning*, Commission on Instructional Technology, Printed for the Committee on Education and Labor, House of Representatives, U.S. Government Printing Office, Washington, D. C., 1970.

major portion of its research by contract with universities, nonprofit institutions and other organizations."

- o "The Institute would set priorities for research and experimentation projects and vigorously monitor the work of its contractors to ensure a useful research product."
- o "It would...link the educational research and experimentation of other Federal agencies--the Office of Economic Opportunity, the Department of Labor, the Department of Defense, the National Science Foundation and others--to the attainment of particular national educational goals."
- o "...the 1971 budget increases funds for educational research by $67 million to a total of $312 million. Funds for the National Institute of Education would be in addition to this increase."

Topics. In the course of his Message, the President identified six topics to which the NIE is expected to turn its attention:

1. *New Measures of Achievement.* "To achieve...fundamental reform it will be necessary to develop broader and more sensitive measurements of learning than we now have."

"The National Institute of Education would take the lead in developing these new measurements of educational output. In doing so it should pay as much heed to what are called the 'immeasurables' of schooling (largely because no one has yet learned to measure them) such as responsibility, wit, and humanity as it does to verbal and mathematical achievement."

"It would develop criteria and measures for enabling localities to assess educational achievement and for evaluating particular educational programs, and would provide technical assistance to state and local agencies seeking to evaluate their own programs."

2. *Compensatory Education.* "The most glaring shortcoming in American education today continues to be the lag in essential learning skills in large numbers of children of poor families."

"...the best available evidence indicates that most of the compensatory education programs have not measurably helped poor children catch up."

"The first order of business of the National Institute of Education would be to determine what is needed--inside and outside the school--to make our compensatory education effort successful."

3. *The Right to Read.* "Achievement of the right to read will require a national effort to develop new curricula and to better apply the many methods and programs that already exist. Where we do not know how to solve a reading problem, the National Institute of Education would undertake the research. But often, we find that someone does know how, and the Institute would make that knowledge available in forms that can be adopted by local schools."

4. *Television and Learning.* "Our goal must be to increase the use of the television medium and other technological advances to stimulate the desire to learn and to help teach."

"The technology is here, but we have not yet learned how to employ it to our full advantage. How can local school systems extend and support their curricula working with local television stations? How can new techniques of programmed learning be applied so as to make each television set an effective teaching aid? How can television, audio-visual aids, the telephone, and the availability of computer libraries be combined to form a learning unit in the home, revolutionizing 'homework' by turning a chore into an adventure in learning?"

"The National Institute of Education would examine questions such as these, especially in the vital area where out-of-school activities can combine with modern technology and public policy to enhance our children's education."

5. *Experimental Schools.* The experimental schools program, designed "as a bridge between educational research and actual school practices," would become the responsibility of the NIE.

6. *Early Learning.* The experimental units of the Early Learning Program, working with the National Institute of Education, will study a number of provocative questions raised in recent years by educators and scientists:

- The "awesome" difference in language and number competence between lower- and middle-class children at the time they enter first grade: What does this mean for compensatory education?

- o The decline in I.Q.'s of poor infants between 14 and 21 months and the ability to forestall it by skillful tutoring during their second year: How should this affect education of the very young?
- o The belief that the best opportunity to improve the education of infants under the age of three lies through working with their mothers: What might be done to communicate the latest information on child development techniques to these mothers?

NIE Legislation

The "National Institute of Education Act" was first introduced in March 1970 in the House and in the Senate. The Ninety-First Congress adjourned before it could be acted upon. A somewhat revised version of the bill has been introduced in the Ninety-Second Congress. It provides the following major features for the NIE:

Purpose. The purpose of the NIE is to conduct and support educational research and disseminate educational research findings throughout the nation; also, to train individuals in educational research, promote the coordination of such research within the Federal government, and construct or provide for necessary facilities.

"Educational research" is defined to include research, planning, surveys, evaluations, investigations, experiments, developments, and demonstrations in the field of education.

Location. The NIE is to be a separate agency, equivalent to the Office of Education in status, within the Department of Health, Education and Welfare.

Director. The Director will be appointed by the President and confirmed by the Senate. He will be at "Level V" in the Federal Executive Schedule--equivalent to the rank now held by the Commissioner.

Personnel. Professional and technical personnel could be appointed and compensated without regard to the provisions of the Civil Service System, as deemed necessary by the Secretary to accomplish the functions of the Institute. (This provision is modeled on similar authority held by the NSF.)

Advisory Council. The Institute would have a National Advisory Council on Educational Research and Development consisting of 15 members appointed for staggered three-year terms by the President. The Council would advise the Secretary of HEW and the Director of the Institute on the status of educational research in the United States and on matters of general policy arising in administration of the NIE Act; make recommendations to them on strengthening research and dissemination of research findings; and present an annual report on the current status and needs of educational research in the United States to the Secretary, for transmittal to the President.

The Council could employ its own staff without regard to the provisions of Civil Service and could enter into contracts for studies necessary to the discharge of its duties.

Funds. Funds provided to the NIE under the continuing authorization in the NIE Act would remain available until expended. This means that funds appropriated by the Congress for a particular fiscal year would not have to be spent within that year or returned to the Treasury; they would remain available for use by the Institute in subsequent years.

General Provisions. The NIE is authorized to utilize the services and facilities of other Federal, public, or private nonprofit agencies; to make payments in installments; to accept gifts and voluntary services; to transfer funds or to accept funds from other Federal agencies for purposes authorized by the Act. It is also required to abide by certain labor standards.

PLANNING FOR THE NIE

There is considerable agreement among the several proposals for a National Institute (or Institutes) of Education on various features: location within the Department of HEW; separation from the Office of Education (OE); conduct as well as support of development, in addition to research; and concern with the problems facing American education. There is possible disagreement on whether the NIE should be singular or plural when it begins. But an even larger set of questions exists on

which there is neither agreement nor disagreement, since the proposals have not explicitly attempted to answer them:

- How shall the Institute(s) be internally organized?
- With what levels or kinds of education shall the Institute(s) be concerned?
- By what procedures shall the advice and counsel of those in the education community be obtained?
- What steps shall be taken to achieve a successful beginning for the Institute(s)?

There are many other similar questions. Some cannot be answered until the Institute is authorized by the Congress, comes into existence, acquires a Director and a staff, develops a program, and sets to work. Some, however, must be answered in order for it to come into existence. To answer those questions, the Department of HEW has sponsored a planning study. This report presents the findings of that study.

Conduct of the Planning Study

The planning study began by identifying the questions that needed to be addressed. These fell into five categories:

1. *Objectives*: What should the principal objectives of the NIE be?
2. *Program*: What program activities should the NIE undertake? How should the choice of program activities be made?
3. *Organization*: What should the internal structure and management procedures of the Institute be?
4. *Relations to Other Parts of the Education System:* How should the NIE relate to other Federal, state, local, and private agencies concerned with education?
5. *Initial Activities*: What early activities will give the NIE the best chance of success?

A list of more specific questions in each category appears in Appendix B.

Several sources were employed to help develop answers to the questions. The first, and most important, was wide consultation with individuals in education and research whose experience has provided them

with knowledge and insight about the issues being considered. This consultation initially took the form of individual discussions and, more usually, participation in group discussions at conferences organized to discuss the NIE. At the end of October 1970 a preliminary draft of this report was presented to HEW. During November briefings and discussions were conducted throughout the government. Early in December the draft was circulated to over 450 individuals in education and R&D representing a wide range of interests. About 150 letters of comment were received in response by mid-January. These letters were used to guide the revision of the draft. This report is the result.[9]

The second source was examination of comparable research organizations, such as NIH and NSF, for lessons from their experience that might be applied in the planning for NIE. The existing OE agencies concerned with educational research, especially the NCERD, were also examined, so that their experience might be taken into account.

A third source was the scholarly literature concerned with educational R&D, science policy, the management of R&D enterprises, and Federal science administration.[10] This literature, though still young, is a distillation of considerable experience about what is needed to develop and run an effective R&D organization. Its principal shortcoming, from the point of view of this study, is the fact that it has been developed primarily on the basis of experience with physical science and engineering activities. The nature of the behavioral and social sciences and educational R&D is sufficiently different from that of "hard science" activities that considerable care must be exercised in translating the lessons learned in the management of one to the other.

Continuing Planning for the NIE

Planning for the NIE is and must be a continuing process. Its

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[9] A list of the individuals and groups contacted, of the presentations given and meetings held on various aspects of the NIE, and of those who provided letters of comment on the draft report is given in Appendix C.

[10] A bibliography of the literature that proved useful in the course of the study is given in Appendix D.

first step produced the concept described in the President's Message and the accompanying proposed legislation. This study is the second step. Subsequent steps will occur during the Congressional hearings and after the Institute's formation and will continue as long as it retains the capacity to renew itself as circumstances change. This plan, then, should be viewed as part of a continuing evolution.

Planning for the NIE is also a complicated and delicate process. What the NIE becomes must, in the end, be determined by the needs of American education as identified by the Director and his staff, with the participation of the Institute's advisory groups and the Executive and Legislative branches of government. Too much specificity in planning might inhibit the capacity of the Director to build a truly effective and responsive Institute. Yet the Congress, the education community, and other interested parties must have a clear sense of the Institute's likely form and practice if they are to judge well its desirability. The present preliminary plan, then, attempts to strike a balance between these competing needs, to present one picture of what the NIE might become. It is more definite in those instances where the recommendations of those consulted were most in agreement. In other instances it suggests or provides examples, but indicates that specific choices should be deferred until the NIE is created.

During this planning study, then, the questions involved in the design of a viable and effective NIE have been discussed and examined from a number of points of view. This report attempts to convey the essence of those discussions, drawing them together, and framing a coherent, reasonably detailed picture of what the NIE might become. It is in no way considered to be final, however. *Its primary role is to solicit the comments and reactions of concerned audiences*. Please read it carefully and consider the National Institute of Education it portrays. What has been left out? What has been included that should not be? How might the proposed Institute be improved?

II. OBJECTIVES

The President's *Message on Education Reform* and the *National Institute of Education Act* state some objectives for the NIE. In the Message, there is emphasis on the need for "a coherent approach to research and experimentation" and "the serious, systematic search for new knowledge needed to make educational opportunity truly equal." The bill "declares it to be the policy of the United States to provide to every person an equal opportunity to receive an education of high quality regardless of his race, color, religion, sex, national origin, or social class." After noting that "inequalities of opportunity to receive high quality education remain pronounced," it states that "to achieve equality will require far more dependable knowledge about the processes of learning and education than now exists or can be expected from present research and experimentation in this field....The Federal Government has a clear responsibility to provide leadership in the conduct and support of scientific inquiry into the educational process."

But while these statements express the central concerns motivating the NIE proposal, they leave unstated much about purposes and priorities that must be known as the Institute is developed. Among the major questions about objectives for the NIE are the following:

- Should the NIE be concerned only with the urgent problems of education, or should it support basic research as well? (The question is also asked in the inverse form, with "basic research" and "urgent problems" exchanging places.)
- Should the NIE be interested only in primary and secondary education, or should its interests extend to preschool and higher education?
- Should the NIE consider the education that goes on outside of schools or limit itself only to the formal system of schooling?
- Should the NIE focus its energies or spread them over the whole field of education?
- Should the NIE provide continuity and stability of support for R&D, or should it be responsive to the changing priorities of education's politics?

- Should the NIE direct R&D activities itself or respond to the interests and recommendations of researchers?

To permit these questions to be answered consistently, we have framed a statement of objectives for the NIE. The primary, overarching objective must be:

- *To improve and reform education through research and development.*

To attain this objective, the NIE should undertake efforts directed toward four specific supporting objectives:

I. To help solve or alleviate the problems and achieve the objectives of American education.

II. To advance the practice of education as an art, science, and profession.

III. To strengthen the scientific and technological foundations on which education rests.

IV. To build a vigorous and effective educational research and development system.

These objectives are described in greater detail on the following pages.

PRIMARY OBJECTIVE: TO IMPROVE AND REFORM EDUCATION THROUGH RESEARCH AND DEVELOPMENT

What kind of improvement and reform? American education has achieved a striking record of sustained growth during the past 70 years. No matter how measured, access to education by Americans during that period has improved dramatically. In 1900, somewhat over 50 percent of school-age whites, but only 30 percent of nonwhites, were in school. By 1970, over 90 percent of both nonwhite and white school-age children were in school. In 1900, fewer than 5 percent of the 18- to 21-year-olds were enrolled in higher education; by 1970 the proportion had reached 50 percent.[1] In the last decade alone, resources devoted to education have more than doubled: $27 billion in 1960, $70 billion today; the number of students has increased by over one-fourth: 46 million in 1960, 59

[1]Ferris, A. L., *Indicators of Trends in American Education*, Russell Sage Foundation, New York, 1969.

million now; and the number of teachers and administrators has grown by almost 50 percent: 2.3 million in 1960, 3.4 million today.[2] *Almost one-third of America's citizens and almost one-tenth of our GNP are now devoted to education.*

Yet the lesson of the last decade has been that access to schooling is not enough. Despite the widespread availability of education, *equality of educational opportunity* still does not exist. Schools and school programs designed to serve the median American in town or suburb fail to motivate or educate the child brought up in urban ghetto or migrant labor camp. And the child who enters school with the disabilities caused by poverty and prejudice generally leaves as far behind as he started, only to begin anew the cycle that will see his children entering school under similar burdens. Even the town or suburban resident may find that the schools do not offer him an opportunity for education that will serve his career or personal needs, especially if he is not college-bound or if his desire for education develops after the age for formal schooling.

And despite the growth in school and college attendance, the *quality of American education* has not generally reached the standards desired by educators, students, and parents. For too many students, education must be taken like bitter medicine. The appetite for learning that most children possess is too rarely tempted in our schools. What is taught is often outdated or inappropriate to the needs of the age in which the students live. And the methods by which it is taught have been little affected by the new possibilities created by technology or the increased appreciation of the need to recognize individual differences in interest and capability.

Finally, despite the growth in resources allocated to formal education, knowledge of how to use *educational resources effectively* is still not adequate to enable educators, students, and voters to make the best possible use of the resources that are available. Certainly, more substantial and equitable means of financing education will have to be found if improvement is to occur in the equality and quality of

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[2] *Saturday Review*, September 19, 1970, p. 67.

educational opportunity. But the need to request additional resources only makes it more critical that education use wisely whatever funds, teachers, buildings, and students it has. Improvements in resource use can come from many places: hours that teachers waste on unnecessary bookkeeping or monitoring might be used to help students over difficulties; funds spent on elaborate equipment might provide simpler supplies for many more classrooms; buildings sitting vacant during evenings and vacations might serve other learners during those times.

Thus, "to improve and reform education" means to seek advances of three specific kinds:

- o *Increased equality of educational opportunity,*
- o *Higher quality of education,* and
- o *More effective use of educational resources.*

It is toward these goals that the NIE must set its course and against them that it must measure its progress.

What kind of education? Education in all settings, both within schools and outside of them, and of all Americans, before, during, and after the traditional school ages, should be within the scope of interest of the NIE.

Education has too often been torn by arbitrary divisions into levels or subjects or formats; if the NIE is to bring to education "a coherent approach" and "a serious, systematic search for new knowledge," it should not be unnecessarily hampered by conventional distinctions and artificial barriers. The NIE should be able to relate children's learning at home, in the streets, and from the TV screen to their learning in schools. It should be free to seek the consistent application of new knowledge to the learning process in all educational settings. And since a problem seeming to reside in one part of the educational system (say, elementary education) may be discovered upon study really to reside elsewhere (say, in teacher education), the NIE should have a broad enough charter to permit the thread of an educational problem to be followed across the educational fabric.

With finite funds and finite competence, the NIE will not be able to work on every aspect of education at once. The NIE will have to

make choices, establish priorities, and choose its targets carefully. It will have to seek to do with its forces what seems most important and productive at the time. The NIE might, thus, concentrate initially on the early development and learning experiences of our nation's disadvantaged and devote relatively less effort in its early years to post-secondary education in the sciences and humanities or the needs of the gifted. But education's areas of severe need will shift as some problems are reduced, society's demands change, or previously hidden difficulties are perceived. And the NIE should be free to shift its attention in consonance.

By what means? The final phrase of this statement of the NIE's primary objective is "through research and development." The NIE will share its concern for the improvement and reform of education with many other agencies, including the OE. What will distinguish the NIE will be its concern with particular means to that end. By "research and development"[3] will be meant the entire spectrum of activities from reflective thought in the library, through careful laboratory experimentation, the design and testing of products, and large-scale field testing, to applied problem-solving in practical settings. The NIE's concern will be with the development, demonstration, and dissemination of knowledge, tested techniques, and products through which education can be improved. It must devote considerable attention to activities that assist in the implementation of its developments. However, the *widespread* introduction and use of those developments will remain the concern of other Federal, state, local, and private education agencies.

How should the NIE go about improving and reforming education through R&D? Should it

- Focus its energies on solving *pressing educational problems?*
- Devote its attention to *strengthening the processes and techniques of education?*
- Concentrate on *basic research* to build a solid base of knowledge?
- Seek to *build a vital R&D system?*

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[3]Appendix E presents a more extensive discussion of the nature of educational R&D.

The consensus of those consulted during this planning study is that the NIE must pursue a mixed strategy; no single approach would be sufficient. All of these activities must be undertaken, not only separately but in close association and combination.

Basic research can be expected to produce new insights that, in the future as in the past, will lead to important improvements in education. But without the complementary problem-solving efforts that help to shape the questions to which research turns and that help to put the findings of research into practice, it will not achieve its full effect. Moreover, measured in terms of the ultimate criterion--improvement and reform in education--both strengthening the foundations of education and attempting to alleviate the pressing problems of education are effective investments. The former may have widespread and fundamental influences eventually, but its impact tends to come farther in the future; the latter may not have quite as great an influence, but the benefits tend to come sooner. Thus, a well-designed program should achieve both goals in a balance determined by estimates of eventual effect. And, by similar arguments, a well-designed program should devote some of its resources to sharpening the tools of education and to building the R&D community. Thus, to serve its primary objective, the NIE should have four supporting objectives, which define its multiple approach to improvement and reform of education.

SUPPORTING OBJECTIVE I: TO HELP SOLVE OR ALLEVIATE THE PROBLEMS AND ACHIEVE THE ASPIRATIONS OF AMERICAN EDUCATION

What kind of effort? The most direct way to seek improvement and reform in education is to make a concerted effort to overcome those educational problems that seem most pressing or to attain those objectives that seem most promising. Just as teams of scientists and engineers in other fields have concentrated efforts on conquering polio, or the corn borer, or the military forces of our adversaries, and on placing man on the moon, so might similar teams of researchers and developers address the "urgent pathologies"[4] and the vital goals of

[4]This phrase was suggested by Stephen Wright of the College Entrance Examination Board.

American education. Indeed, one of the most frequently heard charges against current educational R&D is that it has not concerned itself sufficiently with major educational problems and objectives.

The NIE should devote a major portion of its resources to comprehensive programs addressing specific problems and aspirations of American education. Some programs of this nature are described in Program Area I of the tentative NIE program presented in the next chapter. These programs would have three purposes.

The first would be to *assure that the best of our current knowledge is brought to bear on current problems.* What is known now is not sufficient to cure most of those problems, but enough is known about many topics to do better than is being done. To begin with, then, the NIE should seek to identify, clarify, and make available the best current knowledge applicable to major educational problems. But more can be done.

The second purpose would be to undertake further *R&D efforts designed to extend our knowledge and capability* to resolve particular problems, even in the short run. These efforts would involve a closely linked series of projects of various kinds, all intended to help solve the problem under attack. Among the projects would be analyses of current practices to point the way to promising improvements; experiments designed to test and evaluate new approaches; product and curriculum developments to meet needs not being satisfied; laboratory research to improve understanding of important phenomena; other basic and applied research intended to define more clearly the nature of the problem; and a wide range of activities directed at putting the program's findings into practice.

The third purpose would be to *identify specific gaps and deficiencies in education's tools or foundation knowledge* whose elimination would lead to improved solutions to educational problems or better achievement in the future. By identifying those deficiencies, the program could shape the activities undertaken in the other parts of the R&D system so that in the future the needed knowledge and techniques will become available.

Thus the concentrated attack on a severe problem (or vital goal) of education is likely to include interwoven activities ranging widely

across the spectrum of R&D, from evaluation of current practice through experimentation with new ideas and the development of improved curricula to basic research on education's foundations.

Which problems and aspirations? What are the deficiencies whose urgency is most compelling? To what problems should the NIE develop a coordinated approach? In health, the identification of a disease demanding attention has not been difficult; smallpox, polio, heart disease, stroke, and cancer are reasonably well-defined, widely spread problems, recognized in the public consciousness in terms not inconsistent with the way they are seen by the medical research community. In education, however, there are no satisfactory characterizations of pathologies, no common vocabulary with which to talk about problems. Indeed, there is frequently disagreement about what is cause and what is symptom; about what is a solvable problem and what is an unfortunate situation inherent in the way things are. And the problems as defined in the headlines may not be the ones that deserve priority in an R&D program. Nevertheless, the NIE must begin by examining the problems as they are perceived by the public. From that examination will come the sharpened perception and heightened understanding that will define the problems on which the NIE should concentrate its resources. Here are some of the symptoms the NIE must examine:

- *Inadequate education of the disadvantaged.* Ghetto blacks, poor whites, Puerto Ricans in large cities, Chicanos, American Indians, and a number of other groups handicapped by low income, prejudice, and low social status, leave the schools without achieving competence in such basic skills as reading, writing, and mathematics sufficient to assume a satisfactory role in the general society. In most cases they leave, as well, without acquiring the vocational skills needed to obtain a satisfying job. Frequently they leave feeling less, rather than more, a part of the society they will enter.

This complex of inadequacy has frequently been described as "the reading problem," as "the problem of bilingual education," as "the vocational education problem," or as "the problem of inadequate responsiveness by the schools to community needs." Under careful examination

by the NIE, one of those aspects may indeed turn out to be central and deserving of greater effort than the others. In any event, *the NIE must devote itself to the pressing problem of improving the education of the disadvantaged.*

Other problems perceived by the public that the NIE might examine include:

- *Uninteresting and inappropriate education.* Many students throughout the educational system, from preschool to graduate school, still have their taste for learning deadened by dull teaching of useless or outdated topics in inflexible classrooms.
- *Insufficient attention to the needs of many clientele.* Teenagers who wish to go directly to work, women who want to resume education after raising their children, and adults who wish to continue formal education while working are rarely well-served by the educational system; their needs are met, if at all, through auxiliary institutions, underfunded and understaffed.
- *Inadequate use of extra-school educational opportunity.* Preschool, school-age, and postschool students can learn more through their experiences outside of school--via television, library, club, or job--than they do within it, yet those opportunities to learn are more often seized to sell or entertain than they are to inform or enlighten.
- *Disorder in the schools.* Students, instructors, and administrators in urban elementary and high schools, suburban high schools, and college campuses everywhere bring America's racial, generational, and political conflicts into the classroom, tearing the social fabric of their schools.
- *Inappropriate forms of governance.* At each level of education, the traditional distribution of authority and responsibility among community, students, faculty, administration, and board is shifting under the weight of political and social forces, although there is little agreement about what distribution would be appropriate.
- *Inadequate financial support.* Voters, taxpayers, and legislators in city, suburb, and countryside have begun to withhold

their previously generous support to educational institutions at all levels, questioning the effectiveness of the schools' performance, just when additional resources seem necessary to increase their effectiveness.

- *Ineffective use of existing resources*. Teachers and professors, deans and principals, superintendents and presidents, school board members and trustees, taxpayers and alumni lack the information needed to bring about the most effective use of education's scarcest resources: hours to teach in, hours to learn in, and dollars to make those hours possible.
- *Difficulty in assessing results*. Efforts to overcome these problems are hampered by the inadequacies of existing methods of identifying the range of outcomes of educational programs to those who must select among them--parents, students, teachers, administrators, boards, and legislators.
- *Difficulty in achieving improvement*. Throughout the educational system those who seek improvement are constrained by inadequate budgets, unchangeable institutions, insufficient information, and unresponsive individuals or groups; the disincentives to change often outweigh the incentives.

But even more clearly here than in the case of the disadvantaged, these "problems" do not have the compelling clarity of biological disorders. They overlap, interact, and vary in significance. Terms like "ineffective," "difficulty," "inadequate," and "insufficient" describe extremely imprecise judgments, grounded in the intuition produced by headlines, rather than by the knowledge derived from careful analysis of data. That serious problems exist in each of those areas there can be little doubt; what the nature and extent of the problems really *is* is far less certain. Thus, one of the NIE's most important functions is likely to be the "illumination"[5] of education's problems with sufficient brilliance to enable effective attempts at solution to be developed. *The analysis necessary to produce such illumination should be expected*

[5]This term was suggested by Professor John Tukey, Princeton University.

to be a continuing part of the process by which the NIE identifies and addresses the problems of education. The intramural R&D staff of the NIE would devote a major part of its effort to this analysis.

With what limits? The NIE's attempt to develop practical solutions to educational problems will quickly encounter the limits of education's power.

First, many of the pathologies may arise from individual and societal deficiencies outside the responsibility of education. Second, resource limitations and statutory, contractual, or conventional constraints inhibit the ability of the education system to change. And third, the tools of education and understanding of the phenomena with which it deals are so crude--compared, say, to the techniques of medicine and the understanding of human physiology, genetics, and biochemistry--that many of the attempts at problem-solving will be seriously impeded. It will turn out often that evaluation techniques to measure deficiencies and meter progress will be missing; teaching strategies to achieve certain desired effects with particular groups of students will be absent; and knowledge about forms of schooling based on different conceptions of the role of education will be nonexistent. The range of alternative solutions to educational problems is severely constrained by the limitations of educational practice. Therefore, satisfying this objective of the NIE depends in a direct way on success in satisfying the next objective: advancing the practice of education as an art, science, and profession.

SUPPORTING OBJECTIVE II: TO ADVANCE THE PRACTICE OF EDUCATION AS AN ART, SCIENCE, AND PROFESSION

Educational practice has four aspects: instruction, administration, assessment, and the education of educators. Instruction concerns both what is taught and how. Administration establishes the organization and management of education. Assessment measures and evaluates the outcomes of education. The education of educators transmits educational practice to present and future practitioners. Current educational practice is deficient in each of these aspects; each must be advanced.

However, educational practice, unlike most practice in industry or agriculture, is not a highly technical process whose procedures and quantities can be adjusted scientifically until the outcome matches the desired result. Rather, educational practice is an individual and social process, highly influenced by the qualities of each practitioner and the needs and values of each community. Therefore, educational practice cannot advance solely as a science; it must also develop as an art, shaped by creative individuals; and as a profession, responsive to community needs and values.

The NIE should commit a significant portion of its resources to continuing, cumulative programs intended to advance the practice of education as an art, science, and profession. Some aspects worthy of effort are described below. Tentative program activities for the NIE in support of this objective are given in Program Area II in Chapter III, *Program*.

Teaching as an Art. The art of teaching is still primitive, its masters generally known only to the small groups of students they have served. Apprenticeship and other more formal means of conveying the art to a new generation are rare. Study of the techniques and styles of great masters of teaching is rarer still. And there does not yet exist an esthetics of teaching that guides the description and criticism of the teaching process. There are good reasons for this, of course: teaching is a fugitive art, difficult to record; and it is an applied art, difficult to evaluate. The newer technologies, however, offer the opportunity to capture teaching on video tape, on film, or in computer programs, and some of the more creative of contemporary teachers have attempted to describe their teaching styles in books and articles. Students and teachers are becoming more conscious of the "style" of the learning experience. There now exists the opportunity to make significant advances in the art of teaching.

Education as a Science. The science of education, despite its 80-year history, is still in its infancy. Were it mature, it might be expected to provide a substantial body of knowledge about the educative process that would permit the educator to measure the initial

state of the learner; to match teaching method to teacher characteristics, learner characteristics, and content; and to assess the change in the state of the learner after being taught. Progress has been made in each of these areas, of course. Yet the tools of measurement are satisfactory primarily for basic cognitive skills. Knowledge of the appropriate methods of teaching for various learner groups is quite limited. Nevertheless, promising new approaches to the evaluation of noncognitive skills are being developed. Experiments with more carefully designed teaching methodologies are yielding more precise information about what works, under what conditions. Thus, the need and the chance to speed the development of scientific aspects of education exist.

Professional Aspects of Education. In its professional aspects, education, like medicine and law, exists in a reciprocal relation with society. Because of their command of specialized knowledge, skills, and experience, professions are granted certain privileges by society in making decisions that affect the fortune or well-being of citizens. The profession's responsibility, in turn, is to establish the standards of professional preparation and practice that will assure the proper exercise of that trust. These aspects of education require considerable improvement.

The *education that teachers receive* is widely held to be deficient. It rarely combines first-class training, research, and practice in the same complex; consequently, teacher education is generally detached both from the frontiers of research and the forefront of practice. Established teachers can practice for 30 years without having to update or refresh their knowledge and skills. As educational R&D grows and increases the potential rate of educational improvement, however, the need to strengthen the system of initial and continuing teacher education will grow even more crucial. Teachers are at the cutting edge of education; therefore, improving and reforming education depends, in large measure, on improving the education of teachers.

Education also bears a major responsibility in determining *what shall be taught*. In doing so, it should work with the community to help articulate the needs of society and of individuals within society.

What, for example, should the elementary school provide its students in arithmetic skills to enable them to be successful consumers, workers, and citizens without further study? How will changes in the future, such as the widespread availability of computers, affect their needs for mathematical knowledge? Similar questions can and should be asked about each potential subject of study. Yet, education's efforts to review and renew what is taught are insufficient. In some areas, especially the sciences, successful new primary and secondary school curricula have been developed in recent years under the leadership of new participants in nonuniversity education--scholars at the forefront of knowledge in the subject area. However, curriculum reform has not yet widely affected many of the other central topics of education, such as the arts and humanities, studies of society and the economy, and career skills. Nor has a viable system of continuing curriculum renewal been created. The improvement of education demands such a system.

Education bears responsibility to society in two other ways. First, it should develop *forms of education* that satisfy the variety of needs that society has. Tradition, rather than creative response to needs, appears to have produced the narrow range of forms currently available. But technology and rapid social change have altered the conditions for which these forms were developed. Education should now take the lead in designing systems that will satisfy the developing requirement for education that continues throughout life, that breaks some of the barriers between school and society, and that deploys technology creatively to broaden access to excellent education.

Second, it should develop *means of reporting on performance* and needs to its clientele and of responding more directly to their needs and desires. The current efforts to introduce "accountability" into the schools, to strengthen community involvement through decentralization of large systems, and to assess the effects of schooling through nationally administered tests are efforts in this direction. Much remains to be done to make them effective means to the desired ends. And much remains to be done in developing other means to those ends.

Educational practice rests on a foundation of knowledge about the psychology of learning, the anthropology and sociology of small groups,

the art of television and film, the technology of computers, the statistical analysis of complex processes, and the economics of human capital, among others. Therefore, meeting the objective of advancing education as an art, a science, and a profession will be dependent upon the progress that is made toward meeting the next objective: strengthening the scientific and technological foundations on which education rests.

SUPPORTING OBJECTIVE III: TO STRENGTHEN THE SCIENTIFIC AND TECHNOLOGICAL FOUNDATIONS ON WHICH EDUCATION RESTS

Educational practice is rooted in an understanding of the *individual* and how he learns and grows; the *group* and how it motivates or inhibits the individual's capacities; the *society* and what it requires of its citizens and they of it; *technology* and how it can assist the process of instruction, and how instruction must account for technology's effects on society.

This understanding is formed, in part, of the "common sense" knowledge each individual develops through experience; in part, of the "received wisdom" of his preceptors and colleagues; and, in part, of the "disciplined knowledge" of scientists and scholars. In comparison with the foundations of the mechanical or electrical industries, of medicine or of agriculture, education's foundations rest far more on "common sense" and "received wisdom" and far less on "disciplined knowledge." The behavioral and social sciences have not yet reached the state of development attained by the physical and biological ones.

But the experience of those other areas suggests the benefits (and the dangers) to be expected as scientific understanding of the individual, of groups, of society, and of certain technologies is increased. Knowledge of physical processes and of biological processes has given us power over them and enabled us to direct them to our ends. Better knowledge of behavioral and social phenomena will confer similar power, for the benefit of education and other social ends.

The NIE should invest a stable proportion of its resources in long-term programs intended to strengthen education's foundations in the sciences and technologies. The prospective benefits are described

below. Some tentative program activities of this kind appear in Program Area III in the next chapter.

The building of this knowledge is, for the most part, not a dramatic process. It depends on the disciplined inquiries of many, many investigators, each pushing his part of the frontier a bit farther forward. Occasionally, an investigator, especially favored with competence, preparation, or luck, will see how to break through the frontier and drive a deep salient into previously dark areas. But even then, the consolidation and thorough exploration of his salient will demand the disciplined energies of his many less-favored colleagues. Those who, like the educator, would use what is known, rather than extend it, frequently know and care little about this process. Their concern is with the map of the territory contained in the textbook and not with the travail of its explorers. Thus it is that basic research does not always exert a direct influence on the practice of education but does always exert an indirect influence through its shaping of the conceptions in which educational practice is rooted.

The effect of a changed conception, though perhaps not dramatic, can be quite widespread. In a recent brief paper[6] on the contributions of successful research to educational practice, Professor J. W. Getzels, of the University of Chicago, noted the following examples of "basic studies that have had manifest effects on...aspects of the school enterprise."

- Thorndike and Woodworth's empirical studies demonstrating the fallacy of the doctrine of "formal discipline," which held that learning something "tough" like Latin or Greek was preparation for life to learn anything "easy," significantly affected what was taught in schools.
- Terman's basic studies of gifted children showing that, contrary to popular belief, they are on the average better than their peers in physical development, emotional adjustment, and social maturity changed the attitudes held about gifted children and their educational needs.
- Lewin, Lippitt, and White's study establishing the relationship between children's behavior and autocratic, democratic,

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[6]Getzels, J. W., *Examples of Successful Research Related to Education*, informal paper, 1970.

or laissez-faire patterns of teacher leadership greatly affected teacher education and educational administration.

- "Guilford's...research on the structure of intellect, which led to the notions of convergent and divergent thinking, [is] now increasingly a part not only of the assessment of children's ability but of the curriculum objectives in many schools."
- "Skinner's basic research on learning and reinforcement...contributed heavily to the development of programmed instruction."
- "Clark's basic research on self-concepts of Negro and white children [was] used by the Supreme Court in its desegregation decision."
- "Hebb's basic research on the effects of sensory deprivation... raised important questions about the role of the early life of disadvantaged children on their later performance in school."
- "Fantz's basic research on the perception of infants during the first months of life...is altering the view that the infant's world is only a buzzing confusion, and is likely to influence the educative provisions in infant and child care centers."
- "Piaget's basic research on cognitive development...is transforming our conceptions of the growth of intellectual functioning from linear to stage models, and is having significant effects on curriculum construction."
- "Schultz's basic research on the economics of education...may alter the prevailing views that schools consume capital to the view that schools produce capital, and thus ultimately have a more profound effect on the financing of education than all the practical packages developed to sell school bonds put together."

Disciplined study of individuals, groups, society, technology, and the other foundations of education is the business of the traditional disciplines. What we know in a rigorous way about the individual as a participant in education comes from the work of the psychologist, biologist, linguist, anthropologist, and philosopher; the group is the subject of psychologists, sociologists, and anthropologists. Society and its institutions are explored by sociologists, anthropologists, political scientists, economists, linguists, historians, and philosophers. Technology is the province of the physical scientist, psychologist, engineer, economist, information scientist, and management scientist. Statisticians, mathematicians, and computer scientists provide some of the methods of study to each of these disciplines. Thus, the NIE should encourage work in the traditional disciplines that promises to strengthen the foundations of education.

These foundation-building activities, like those devoted to advancing education and to solving educational problems, depend on the availability of competent personnel to carry out the work, on the existence of suitable organizations to bring them together and support them in the performance of their tasks, and on managerial competence to allocate available funds effectively. At present, each of those resources is in short supply in education. Thus, the next--and last--supporting objective assumes special importance.

SUPPORTING OBJECTIVE IV: TO BUILD A VIGOROUS AND EFFECTIVE EDUCATIONAL RESEARCH AND DEVELOPMENT SYSTEM

To achieve the objectives just described will require the participation of an extensive and intricate network of research and development institutions and personnel. The NIE should occupy a central, influential role in this network, especially as a source of funds and as a means of bringing about coordinate activities among the many participants, but it will not be able to do even a small portion of the necessary work itself. It must rely upon the educational R&D system.[7]

Had it been designed by some single, far-sighted intelligence, that system might be expected to be the right size, to contain the proper distribution of skills and interests, to have developed appropriate institutional mechanisms for carrying out its tasks, and to have established satisfactory internal mechanisms for communication and quality control. Even if no single intelligence had designed it, but instead some long-term, incremental process of evolution had been allowed to operate, it might have been expected to achieve some close approximation to appropriate size and character through a process of natural selection. However, neither a single intelligence nor a long-term natural evolution has shaped the educational R&D system. It is, rather, the product of decades of indifference followed by a decade of forced expansion. Naturally, the form that it has taken satisfies few of the requisites for an effective system. Compared with the needs of education and the demands that will be placed upon it by the NIE, it

[7]Appendix F describes the participants in the educational R&D system.

is too small, too diffuse, maldistributed, too narrow in scope, and lacking in nonacademic institutions.

Too Small. There is no precise rule by which the proper size of the educational R&D system could be determined. In the long run, proper size for an R&D system depends on the scope of the subject, the chances of success, the benefits to be expected, and the costs. In the short run, it is limited by the availability of personnel and by the state of knowledge. Decisions, however, can be made on simpler, incremental grounds: Should the system be increased, decreased, or kept the same during the next year or two?

Two informal arguments suggest that at this time the educational R&D system should be increased. The first argument is simply that, compared with the R&D system serving other national enterprises of similar size, no greater importance or need, and no less challenge, the educational R&D system is quite small. The previously noted comparison[8] with agriculture and health, both of which have benefited dramatically from R&D during the last several decades, is especially telling. It is reviewed in Table 1.

Table 1

RESEARCH AND DEVELOPMENT EFFORT IN EDUCATION, HEALTH, AND AGRICULTURE (1968)

Area	Contribution to 1968 GNP ($ billions)	Expenditure for R&D ($ billions)	R&D/GNP Contribution (percent)	Effort Devoted to R&D (equivalent man-years)
Education	53.0	0.190	0.3	4,500
Health	51.5	2.400	4.6	59,000
Agriculture	73.5	0.800	1.1	26,000

Although all three enterprises are large and of roughly similar size, agriculture spent 4 times the dollar resources and almost 6 times the manpower on R&D as did education; for health, the difference was even more dramatic--13 times the dollar resources and 13 times the manpower.

[8] Appendix G contains further information about this comparison.

Whereas agriculture allocated 1.1 percent of its contribution to the GNP to R&D, and health allocated 4.6 percent, education expended less than 0.4 percent. (The situation has not improved since 1968.) The starkness of these figures is emphasized by the relative recentness of education's rise to even that level. As recently as FY 1963, the OE--now the primary source of support for R&D--expended less than $10 million for R&D.

Thus, the comparison with enterprises of similar scope and no greater difficulty that have been greatly benefited by R&D suggests that the educational R&D system is still far below the size needed to contribute significantly to the improvement and reform of an enterprise of education's scope and difficulty.

The second argument is that there are tasks for educational R&D that are important and promise significant benefit, but are not being carried out by the current system because of inadequate resources. In the previous discussion of the NIE objectives, some such tasks were described in very general terms. In the next chapter, a program of activities for educational R&D will be described somewhat more specifically. Here it may suffice to note that currently very few of the local or state education agencies have access to R&D personnel or institutions who could assist with the major problems they face; that careful experimentation with comprehensive educational alternatives is rare; that the findings of R&D are not consistently put into practice; and that development of new practices, equipment, and curricula is still occurring at a very slow rate.

Too Diffuse. Scientists and engineers frequently refer to the need to achieve "critical mass" in an R&D enterprise. The term comes from nuclear physics, where the critical mass of radioactive material is the amount needed to achieve a self-sustaining nuclear reaction. It has come to mean the minimum size and composition of a research or development group necessary to achieve a vital, self-sustaining, creative atmosphere for the task at hand. In basic research, quite theoretical in character, the critical mass may be one or two researchers; in complex developmental and experimental programs, the critical mass may be several hundred individuals having a great diversity of skills.

When the critical mass for larger tasks cannot be achieved, individual researchers tend to pursue small tasks on their own. These small tasks rarely cumulate to achieve major effects.

Another kind of critical mass is the one that increases the power of a large enough group of research teams, each pursuing its own topic within the same field at the same institution. The different points of view and approaches to the field come together both formally and informally, enriching the criticism and insights available to each, and leading to the formation of new teams, new approaches, and new points of view. Anyone who has experienced such an atmosphere is aware of the enhanced creativity and productivity it produces.

Educational R&D has suffered from a lack of R&D groups that have attained either kind of critical mass. The R&D Centers and Regional Educational Laboratories were established to achieve interdisciplinary R&D groups (in the first case) and development groups (in the second case) of sufficient size to be effective. Some of those 23 groups have begun to "go critical," but in total they are still a small portion of the system. Some schools of education have attempted to achieve development groups, but their aspirations have been hindered by lack of funds. The typical situation in education is still the one- or two-man research study, in which the participants engage part-time. There is a strong need to form larger critical masses of R&D personnel working on the central issues of education.

Maldistributed. Related to the problem of attaining critical mass is that of achieving a proper distribution of effort among the activities from research through development to implementation. Insufficient effort in development and implementation will impede the application of increased knowledge in practice; not enough effort in research will inhibit effective development and implementation. More specifically, effective R&D systems, such as those that serve industry, health, and agriculture, have developed complex networks of activities linking research with practice and have staffed them with specialists such as design, production, and sales engineers, agricultural extension agents, and medical detail men. The educational R&D network, by contrast, is incomplete and imbalanced. What improvements there are have occurred

during the last decade with the increase in funds from the OE and the NSF for developmental and implementation activities. Nevertheless, educational R&D still displays the consequences of its long isolation in the school of education: 60 percent of educational R&D funds were spent in universities and colleges in 1968, but only 37 percent of health and 22 percent of agriculture R&D funds were. Educational R&D is still heavily weighted toward the kinds of research and evaluation activity favored by such settings.

What are *underdeveloped* are the kinds of activity that in other fields are carried on by industry, agricultural experiment stations, and teaching hospitals. Education devoted roughly 3,900 man-years of effort to development and innovation in 1968; agriculture expended over 28,000 man-years.

What is *virtually absent* is the research-based problem-solving activity in the operating agency. In 1968 there were only 1,300 man-years of research, development, and innovation carried on in the almost 20,000 state and local education agencies; most of that was testing and gathering statistics.

If educational R&D is to be effective in improving the education of Americans, these maldistributions will have to be rectified.

Too Narrow in Scope. Education is a many-sided subject. It impinges on every aspect of our lives--cultural, social, political, and economic; it draws upon most of our resources--human, technological, institutional; and it concerns all aspects of humanness--philosophical, psychological, biological. Education should, therefore, be a subject of interest to an exceptionally wide range of specialists, from political scientists and economists, through psychologists and engineers, to natural scientists and artists. And it should benefit from their contributions. It is, therefore, both surprising and disconcerting to observe that education benefits far less from such concern than does defense or business--certainly far less than it should.

For a variety of reasons, rooted in history and academic status, educational R&D has been the almost private preserve of the psychologist and, occasionally, the sociologist. Only recently it is beginning to attract the attention of more than a handful of well-trained

researchers in other fields. Economic, political, technological, biological, statistical, and linguistic aspects of education are becoming more respectable subjects of study within the relevant disciplines. But the trend is still young and it has serious impediments to overcome; it will need significant encouragement. Even more important, and more difficult, is the creation of incentives and institutions whereby these various disciplines can work together to bring their complementary talents to bear on significant educational problems.

Lacking in Institutions. If educational R&D is to grow in size, in concentration, in distribution, and in scope, it will have both to draw many more scientific and developmental personnel into its efforts and to provide appropriate settings in which they can work. Presently, the choices are quite narrow. The distribution of man-years of educational R&D effort, by setting, in 1968 is shown in Table 2, which is adapted from data in Appendix G.

Table 2

DISTRIBUTION OF EDUCATIONAL RESEARCH AND DEVELOPMENT MAN-YEARS, BY SETTING (1968)

Setting	Man-Years
Universities and colleges	2,100
Total	2,100
State agencies	230
Local school agencies	800
Professional associations	280
Total	1,310
Private research institutions	260
Private firms	120
Educational laboratories	750
Total	1,130
Grand Total	4,540

Since most R&D in universities and colleges is a part-time occupation, the 2,100 man-years in the chart represent the effort of a far greater number of individuals. In the other settings, however, R&D is more likely to be full-time. Thus, the great majority of educational R&D personnel are in higher educational institutions.

There are no more than 200 colleges and universities at which educational R&D is conducted. Of the 18,000 or so state and local education agencies and professional associations, clearly only a very small proportion can be devoting any effort to research, development, or innovation. Similarly, only several tens of private firms, at most, are responsible for the 120 man-years of effort expended in such settings. Finally, there are 15 Regional Educational Laboratories. This catalog describes the present institutional setting for educational R&D.

How should it be strengthened? Several actions seem highly desirable.

First, the *higher education settings* could be strengthened by involving a wider range of disciplines than is currently active, by building critically sized centers for interdisciplinary R&D in education, and by linking R&D more closely with the education of educational personnel and with educational practice. (This effort, of course, has been begun--with some success--with the creation of Research and Development Centers.)

Second, the *state and local educational agency settings* could be strengthened by establishing R&D as an essential activity in all operating agencies. That is not to say that basic research or even product development should be under way in those settings, but rather that individuals with a solid training in educational science and technology should be there and that they should work closely with teachers and administrators. The R&D personnel would help with immediate, operational problems; assist in planning and evaluating innovative programs; link the knowledge and tools of educational R&D with practice; and encourage and monitor the conduct of appropriate R&D in other settings. The presence of such personnel, aware of the findings of R&D and the problems of practice, throughout the operating system of education would go very far toward overcoming the considerable gap between research and practice that currently exists. Their position would be comparable in many respects to that of the engineer and operations analyst in industry or the extension agent in agriculture.

Third, the *private profit and not-for-profit institutional setting* could be strengthened by increasing its size and scope of activity and

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by linking it more closely to the state and local agencies and to the higher educational institutions. These institutions provide the major setting in which large-scale, long-term developmental and experimental efforts can be conducted. They also provide a setting in which critically sized, mixed teams of researchers and developers can be brought together to serve the needs of many different local and state agencies. Thus, whereas a small school district could not expect to hire a permanent staff of economists, psychologists, and technologists to help it plan significant changes in its educational practice, it (or a consortium of similar districts) could hope to make use of a private institution established to build just such expertise. (Again, a start has been made with the establishment of Regional Educational Laboratories, and interstate and local consortia. Much needs to be done to strengthen those efforts, however.)

Thus far, the deficiencies of the performance side of the educational R&D system have been described. However, as was noted in the Introduction, to overcome those deficiencies and achieve an effective program of educational R&D will require considerable competence on the sponsorship side, especially in the principal Federal agency sponsoring educational R&D.

Need for Strong Program Management. The wise allocation of R&D funds is an exceptionally difficult task that demands talents comparable to those needed to carry out R&D itself. The Federal program officer must be able to understand and select among activities that by their nature are at the frontiers of knowledge. He must be able to judge their prospects for success and estimate how well they will serve education's needs should they succeed. If competent and creative R&D talents are to be attracted to and retained in education's service, the program officer must attain their respect for the consistency and validity of his judgments. For these reasons, the agencies that sponsor educational R&D must be staffed by individuals of the highest competence, well trained in research or development, and in continuing close contact with their fields of research or development. In contrast to many government programs in which funds are allocated according to formulas and guidelines, well-run R&D programs are completely

discretionary, with each decision for the expenditure of $10,000 or $1 million demanding expert knowledge and judgment.

Those Federal research funding programs that are generally judged to be successful have met these requirements through the adoption of special personnel systems designed to attract (in competition with universities, hospitals, and industry) scientists and engineers able to guide the wise expenditure of government funds. Two such successful programs are those of the NSF and the NIH. In Table 3 their personnel systems are compared with that of the NCERD.

Although the NSF expends about 5 times as much as the NCERD, it has 36 times as many authorized supergrade positions. Although both the NSF and NIH have flexible personnel systems designed to enable them to compete with the universities and industry for scientific personnel and bring such personnel into government for noncareer appointments, the NCERD employs a personnel system designed to serve the needs of managing large, formula support programs. And although the NSF and NIH have the stature and visibility that derives from leadership by men at the Level II or Level IV rank in the Federal Executive Schedule, the NCERD must assert its responsibility in the Federal government on the authority of a GS-17 director. The conditions do not yet exist to enable the Federal government to attract the caliber of staff needed to run a truly effective educational R&D program.

Thus, the NIE must take as one of its major supporting objectives the strengthening of the educational R&D community, both on the performer side and on the sponsor side. *The NIE should devote a portion of its resources directly to development of the R&D performer community through fellowships, institutional development grants, and similar mechanisms.* Some tentative program activities of this kind are described in Program Area IV in the next chapter. Establishment of the NIE is itself an attempt to strengthen the R&D sponsorship community. Its personnel and administrative provisions are described in Chapter IV, *Organization*.

Table 3

PERSONNEL SYSTEMS OF NCERD, NSF, AND NIH

Item	NCERD		NSF	NIH
Budget, FY 1970 ($ millions)				
Intramural	...		...	120
Extramural	90		438	1,400
TOTAL	90		438	1,520
Managerial Staff, 1970	Authorized	Acting		
Director	1 GS-17	...	1 EL II	1 EL IV
Deputy Directors & equivalents	1 GS-16	1 GS-16	1 EL III	10 GS-18 equiv. 1 GS-17 equiv. 2 GS-15 equiv.
Assistant Directors & equivalents	1 GS-16 3 GS-15	4 GS-15	5 EL V	16 GS-18 equiv.
Deputy Assistant Directors & equivalents	...	...	11 GS-18 equiv.	13 GS-18 equiv. 8 GS-17 equiv. 1 GS-16
Division Directors	...	...	32 GS-17 equiv.	9 GS-18 equiv. 17 GS-17 equiv. 9 GS-16 equiv. 2 GS-15
TOTAL	6	5	50	89
No. with doctorate	0	3	39	81
Professional Staff, 1970 (including management)				
Executive Level	...	...	7	1
GS-16 to 18	3	1	...	87
GS-16 to 18, equiv.	...	...	101	85
(GS-16 & above)	(3)	(1)	(108)	(173)
GS-10 to 15 or equiv.	...	78	397	3,829
TOTAL	3	79	505	4,002
(Intramural prog.)	...	(0)	(0)	(1,582)
No. with doctorate	...	22	158	2,068
No. of Fellowship appointments	...	...	35	285
Personnel System	Civil Service Only		Civil Service Plus	Public Health Officer, Civil Service Plus
1. Freedom to set pay anywhere in supergrade range	No		Yes	Yes
2. Civil Service approval of qualifications for pay needed	Yes		No	Yes
3. Career appointment	Yes		No	Yes
4. Included in Civil Service retirement plan	Yes		Optional	Yes
5. Agency quota for supergrades	...		No	Yes
6. Filled from Civil Service quota for supergrades	Yes		No	No

III. PROGRAM

The most important and difficult choices to be made in creating the NIE are those that determine its program. The needs of education are so great, the R&D community's capabilities are so limited in comparison, and the available funds are so constrained that the design of a program that achieves the full potential benefit from R&D for education will be a demanding task. It is a task that should occupy a major part of the attention of the NIE staff, leadership, and advisory groups, not only at the beginning but throughout the Institute's existence.

Program also occupies a central place in planning for the NIE. What the Institute will do determines in large measure how it will be organized and how it must relate to its constituencies. It has not been possible during this planning effort to undertake the extensive analytic and consultative process that design of a final program for the NIE would require. However, the character and content of a program have been discussed, individually and in groups, with a wide range of respected individuals from the education and R&D communities. From those discussions has come a preliminary program that, while it cannot claim the legitimacy and stature that the Institute's carefully designed program will achieve, should suffice to establish the basic nature of the NIE's activities and to guide its organizational design. This chapter describes and discusses this preliminary program.

MAJOR PROGRAM STRUCTURE

Almost all of the NIE's program will be carried out by external agencies--higher educational institutions, state and local agencies, R&D Centers, Regional Laboratories, and other non-Federal institutions. No more than 5 percent, at least at the start, is likely to be performed internally. The major concern in the development of this program, therefore, has been with the description of activities that will be sponsored, but not conducted, by the NIE. The Institute's internal research agency, which will be described in the next chapter, however, will undertake activities within this broad program structure for which its staff and organization are specially qualified. Some examples of its possible activities will also be provided in the next chapter.

The structure of the research program follows the structure of the NIE's supporting objectives defined in the preceding chapter. Corresponding to each of these four objectives is a *program area* of the Institute.

- o *Program Area I: Solution of Major Educational Problems*
- o *Program Area II: Advancing Educational Practice*
- o *Program Area III: Strengthening Education's Foundations*
- o *Program Area IV: Strengthening the Research and Development System*

These program areas are divided, in turn, into several *program elements*. The number and definition of the elements in an area may change over time as priorities and competencies change. A preliminary set of program elements for the four program areas is shown in Table 4.

The program elements comprise, in their turn, a cluster of *program activities*. These would ordinarily be individual projects or groups of closely related projects. An extensive listing of prospective program activities appears later in this chapter. It is intended to convey through specific examples the *kind* and *range* of activity the NIE should undertake. It is not an attempt to describe precisely what the NIE should do.

The four program areas differ in the priority and support assigned to each, in the criteria and methods for program design, and in the range of R&D activities involved.

PROGRAM AREA I: SOLUTION OF MAJOR EDUCATIONAL PROBLEMS

The first priority of the NIE will undoubtedly be to organize, support, and carry out *comprehensive national R&D programs attacking major educational problems*. In support of that priority, *this program area might receive on the order of one-half the resources available to the NIE early in its history*. A number of the problems that might come under attack in this way were listed in the preceding chapter as part of the discussion of Supporting Objective I. As noted there, the process of problem "illumination" is a crucial part of the development of a problem-focused R&D program. Illumination of the nature of education's

Table 4

TENTATIVE PROGRAM STRUCTURE FOR THE NATIONAL INSTITUTE OF EDUCATION

PROGRAM AREA I: Solution of Major Educational Problems--comprehensive R&D programs addressing priority concerns.

- Program Element 1. Improving education of the disadvantaged.
- Program Element 2. Improving the quality of education.
- Program Element 3. Improving the effectiveness of resource use in education.

PROGRAM AREA II: Advancing Educational Practice--cumulative R&D programs developing education as an art, science, profession.

- Program Element 1. Improving the instructional process--method and content.
- Program Element 2. Improving the educational system--organization and administration.
- Program Element 3. Improving educational assessment--measurement and evaluation.
- Program Element 4. Improving the education of educational personnel.

PROGRAM AREA III: Strengthening the Foundations of Education--selective research programs building basic knowledge concerning education.

- Program Element 1. Increase knowledge of the individual as a learner.
- Program Element 2. Increase knowledge of group processes as they affect learning.
- Program Element 3. Increase knowledge of societal influences on education.
- Program Element 4. Increase ability to use technology and media effectively in education.
- Program Element 5. Increase effectiveness of analytical and research methodologies.

PROGRAM AREA IV: Strengthening the Research and Development System--funding to facilitate formation of the complex network of individuals and institutions needed to link research, development, and practice.

- Program Element 1. Develop supply of competent R&D manpower.
- Program Element 2. Develop supply of effective R&D institutions.
- Program Element 3. Strengthen linkage between R&D and practice.
- Program Element 4. Develop structures for information transfer.

most crucial problems will be a major function of the NIE; the intramural R&D activity will play a central role in this process. However, the difficult passage from surface symptom to underlying problem has not been made during the first steps in planning for the NIE. Consequently, any selection of problems for this program area is likely to be flawed. At best, the problem definitions may have to be narrowed or redrawn to bring them into consonance with the capacity of R&D to solve them. At worst, they may be shown by deeper study to be shadows whose substance lies elsewhere. Nevertheless, some major educational problems must be selected, as exemplars, for this preliminary program. From among the variety of problems discussed in the preceding chapter, three have been chosen. They are:

- o The poor education received by the disadvantaged,
- o The inadequate quality of the education received by many, and
- o The need to use education's limited resources more effectively.

For present purposes, this selection of problems will suffice. It has been translated into program elements in Table 4.

To help solve these major educational problems the NIE will want to do two things: first, bring to bear in a coordinated way all that is already known or developed that might help in resolving the problem; and second, focus careful effort on learning and developing what is needed to provide better solutions.

The R&D activity in this program area should be conceived, implemented, and managed through *comprehensive national programs*. These would be carefully designed, coherent combinations of research, development, experimentation, evaluation, and implementation activities directed at solution of major problems. Thus, each comprehensive national program would comprise not only activities intended to employ existing knowledge in the solution of a major problem, but also a wide range of activities--similar to those undertaken as part of the continuing programs in Program Areas II and III--intended to develop the improved practices or basic knowledge essential if better solutions to that major problem are to be obtained. While each of these programs

would be managed centrally to provide coordination and effective planning toward the objective, its component activities would be carried out in many settings.

Central management of each program element would be provided by an NIE *program task force*, led by a *program manager* and advised by an *advisory panel* of educators, R&D personnel, and laymen. The staff of the task force would comprise not only permanent problem-oriented R&D management personnel, but also personnel seconded from those parts of the NIE concerned with support of work on educational practice and foundations. They would bring to the problem task forces an awareness of the state of the art in their areas of concern, and would take back to those areas an enhanced appreciation of the needs of the educational system.

PROGRAM AREA II: ADVANCING EDUCATIONAL PRACTICE

The problem-focused activities undertaken in the first program area depend for their success on the educational tools and practices and the fundamental knowledge available. As noted, these activities will include efforts directed toward improving one or another tool, or toward extending knowledge in a particularly important way. But such activities will be undertaken with the specific needs of the problem area in mind. Even the union of all such activities undertaken as part of the problem-focused programs would not comprise a coherent, cumulative national program intended to improve the state of educational practice. The responsibility for the development and support of such programs falls in this area. *The area might receive as much as one-fourth of the NIE's resources early in its history.*

Among the constituents of educational practice that might be the subject of program elements here are the following:

- The instructional process--the content of instruction and the methods by which it is conveyed to various student groups,
- The educational system--the institutional and unstructured forms through which instruction is made available and how they are administered,

- o Educational assessment--the methods and instruments by which educational progress is measured and evaluated, and
- o Professional development--the forms and content of preparation and continued training of educational professionals.

Once again, it is important to note that the NIE staff and advisory panels may find another categorization of the constituents of educational practice more fruitful. That is not so important here; these constituents will suffice to indicate the nature of the NIE's prospective program.

As a complement to the individual, targeted activities of these kinds undertaken as part of the problem-focused programs, the function of this problem area is the development and support of *continuing, cumulative national programs* that include a range of research, development, experimentation, and implementation activities intended to increase competence in each of the constituents of educational practice. These programs will attempt to do those things that offer the best hope of moving the state of the art forward. The activities would be carried out in many settings, would be less tightly linked together than the components of a problem-focused program element, and would provide both near- and farther-term returns.

Management of the program could be provided by a National Center for each program element, situated within the NIE. For example, the following Centers might be established to correspond to the proposed program elements:

- o Center for Instructional Process
- o Center for Educational System
- o Center for Educational Assessment
- o Center for Professional Development

Each Center would have a *Director* and an *advisory panel* charged with developing a viable national program in its area. The staff, all managers of extramural programs, would include both permanent professional members and others, serving temporary tours, from the R&D and education communities. To assure coordination between these activities and the similar activities sponsored as part of problem-focused programs, staff

members from the Centers would be seconded to serve, part-time, on problem-focused task forces.

PROGRAM AREA III: STRENGTHENING EDUCATION'S FOUNDATIONS

As noted in the description of Supporting Objective III in the chapter on objectives, educational practice and our ability to solve educational problems are founded on our appreciation and understanding of

- o The individual as a learner,
- o Group processes and how they affect learning,
- o Society and its relation to learning,
- o Technology and media useful in instruction, and
- o Methodology for investigating education.

To be able to put a fine edge on educational tools and to improve our solution of educational problems, then, it is necessary to provide a better understanding of the foundations of education. The responsibility for developing that understanding falls in this program area; *it might receive 10 to 15 percent of the NIE's resources early in its history*.

The program elements might correspond to the subjects of concern indicated above. Table 4 includes such a set of elements. They are defined in greater detail later in this chapter. Once again, it must be noted that another definition of program elements may prove more fruitful to the NIE's operations. This one is simply indicative.

The management techniques adopted in this program area should draw heavily upon the successful experiences of the Office of Naval Research, NSF, and NIH. Although their procedures differ in detail, they are based upon a common appreciation of the most effective modes of encouraging and supporting research at the frontiers of knowledge. Each program element should, for example, be seen as a *portfolio of investments in new knowledge*, and like speculative stock portfolios, it is the total yield and not necessarily the performance of each venture that is important. At the same time, a prudent investor will draw upon the most knowledgeable sources in choosing his investments.

Those who know the frontiers of science best are those who are exploring them. Thus, the specification and selection of program activities in this area must depend, even more than in the other areas, on the judgment of active scientists and scholars. However, to avoid too narrow a basis of choice, it will be desirable for the NIE to include a span of disciplines and a span of seniority in whatever review panels it employs to help in program-activity choices.

These activities will, of course, be heavily weighted toward the research end of the R&D spectrum, although the initial development of new technology and media is included in this program area as well. As a consequence, they are most likely to be carried out in traditional university and college settings, although the R&D Centers and Regional Laboratories might also undertake some work as part of larger programs.

The NIE management staff will comprise scientifically qualified *program officers*, who will rely heavily on *review panels* drawn from the research community. The staff will include both permanent officers and a number serving short terms on leave from their academic or research institutions. Like their fellows in Program Area II, they will be seconded to problem-focused task forces to help coordinate their work with support of similar activities as part of the problem-focused program elements.

PROGRAM AREA IV: STRENGTHENING THE RESEARCH AND DEVELOPMENT SYSTEM

The funds and interests made available through the NIE should, in the long run, bring into educational R&D the large enough pool of professionals and network of institutions whose lack was described in the preceding chapter. However, the NIE will not be able to wait for all the natural processes of attraction and decision to be acted out. If it is to make a big difference in the quality and effectiveness of educational R&D, it will have to catalyze the process of growth and organization of the R&D community as suggested by Supporting Objective IV. This is not an unusual function for a national R&D sponsoring organization. The NIH and NASA, among others, have been conscious of the need to help build the R&D communities required to fulfill their functions. This program area is devoted to that activity; *it might receive on the*

order of 10 to 15 percent of the resources available to the NIE early in its development.

Among the constituents of the R&D community to which the NIE might want to devote special attention are

- o R&D manpower,
- o R&D institutions,
- o Linkages between R&D and practice, and
- o Information transfer within the R&D system.

The tools available to serve these purposes include fellowships and traineeships, institutional grants, support for information systems, and support for training.

The management of this area will be in the hands of *program officers*. They need two close linkages, however. One is with a continuous process of analysis and evaluation of the educational R&D community, carried out by the NIE, perhaps in close conjunction with the National Advisory Committee on Educational R&D. The purpose of this analysis and evaluation would be to identify and project into the future national needs for educational R&D personnel and institutions. While such projections are necessarily imperfect, they provide essential guidance for programs intended to produce such personnel and institutions. The other close linkage must be with the R&D programs sponsored by the NIE itself. One of the fundamentals of effective education for R&D is the close and continuous participation by the student in actual R&D projects. Since the NIE will be supporting most such projects in education, it is essential that training projects supported in Program Area IV be tied closely to R&D projects supported in other areas. Similar comments apply to institutional support, which should be related to program support; and to development of information systems, which should be under the aegis of institutions and individuals having R&D competence.

PROGRAM DESIGN

The preceding section has described the broad region of interest of the NIE. A mature national program of educational R&D would support

activities in every element of those four program areas, and in others not mentioned there, as well. However, at this stage in the development of the national educational R&D enterprise, it is unlikely that the resources--financial, personnel, or institutional--will be available to mount so comprehensive a program. *If the NIE is to succeed, therefore, it will have to focus its energies on particularly promising or important R&D activities.* It will have to place some bets.

On what basis should those bets be placed? Two criteria seem central: the *worth* of each individual area of activity, and *balance* in the total program.

The worth of each individual area is a compound of several factors. It depends, first of all, on the *importance* of the corresponding problem or area of concern. In such deliberations, work on reading problems would doubtless rank higher than work on teaching handwriting; fundamental studies of language acquisition would outrank equally fundamental concern with color perception.

But importance is not enough. There must also be a reasonable *probability of success.* This, in turn, depends on the difficulty of the problem or area of study and the availability of adequate intellectual tools, personnel, institutions, and funds to work on it. In several otherwise important areas of educational concern, shortages of personnel or institutions may prevent effective R&D activity.

Finally, there must be a reasonable *probability of implementation.* This is both a substantive and an institutional consideration. Substantively, it means that the likely problem solution or finding cannot be so expensive, difficult to execute, or unacceptable in other ways that it has little chance of being put into practice. Institutionally, it means that the eventual users of the solution or finding have to be involved with and interested in the R&D activity in such a way that the chance of their adopting it is high, and the problems of implementation have to be a part of the planning of the program from its inception.

Many program activities are likely to prove worthy--more than can be carried out or supported early in the NIE's program. The next step in program design, then, will be to select from among worthy

program activities a set that constitutes a balanced program. A number of different balances must be struck.

One is between activities with a near-term return and those whose benefits come in the far term. It will, no doubt, be desirable that the NIE accomplish results as quickly as possible. To do so it will wish to undertake the support of some activities that have been under way a number of years and are coming to fruition. Several such activities should have high priority in program construction. But the NIE will wish to continue to contribute to educational improvement in the future. Educational R&D programs necessarily take a number of years to bear fruit. Thus, at the same time as the NIE is reaping this year's harvest, it will have to plant the seeds of future harvests. A high priority, thus, must also go to several activities showing high promise for longer-term return.

A second balance, related closely to the first, is among large-scale developmental and experimental programs and smaller-scale research and evaluation activities.

A third balance is among the various skills that should be applied in educational research. A properly designed program should include activities involving a broad range of professionals: researchers and developers, persons concerned with content and those concerned with method, social scientists and technologists, creators and analysts.

Finally, some balance must be struck among the various kinds of R&D institution. Most likely, this balance will be determined by the limited availability of certain kinds of setting and their specific competencies.

Thus, program design will result from some complex interaction between the worth of individual projects and the necessity of striking certain balances in overall program design. This interaction must be perceived and applied by some individual or group. The procedures the NIE adopts will be a crucial determinant of its success.

TENTATIVE PROGRAM ACTIVITIES

What would be the specific activities of a full-fledged NIE? Precisely what kinds of project would it undertake? How would they be

distributed among research, development, evaluation, and implementation? How would they be distributed across the levels of education? What mixture of R&D skills would they employ? Where would they be conducted? These questions are hard to answer without referring to a rather detailed program for the NIE. Yet, for the reasons noted earlier, that program must derive from a process of extensive analysis, consultation, and review that has not yet been undertaken. It is a task demanding the staff, advisory groups, and consultants of the NIE itself. More important, it is a task demanding judgments concerning needs and priorities that can only be made through the NIE's mechanisms.

Nevertheless, for several reasons, preliminary planning for the NIE requires more specific information about the NIE's program than is contained in Table 4. First, such information provides those unfamiliar with educational R&D with a map showing the breadth of its territory and enough detail to indicate the varied nature of its terrain. Second, the display of a wide range of specific activities having an understandable relationship to educational improvement and reform is the most valid evidence for the assertion that educational R&D needs additional support. Third, the NIE's organizational design, described in the next chapter, must be guided by an understanding of the kinds of activity likely to be a part of the NIE program. And fourth, a specific listing of activities can serve as the focus for discussion and criticism that will begin the several-phase development of an initial program for the NIE. Thus, this section contains a description of some possible program activities for each of the program elements shown in Table 4. This listing is still *tentative and preliminary*. Many additional steps must be taken before this listing of prospective activities can become an effective program for the NIE.

Among the steps--involving staff, advisory groups, and consultants--needed to transform this tentative program into an initial program for the NIE are the following:

- *Relate activities to those already under way*. Many of the activities in the present listing are already being carried out. The next steps in program development should identify those explicitly, determine the progress being made, and suggest extensions or redirections.

- *Add desirable activities not already included.* Despite the fact that far more appears in the program than educational R&D could hope to accomplish with existing resources, many valuable activities have been left out. No attempt has been made to be exhaustive in the activity listing. Rather, the objective has been to include a sufficient variety to suggest the scope of activities that could appear within a program element. Before undertaking the necessary priority-setting and selection, the next steps in program development should undertake to expand the listing of desirable activities. *It will be especially important to be hospitable to new program directions if the NIE is to achieve its goal of strengthening educational R&D.*
- *Identify relationships among activities.* Educational R&D is a many-dimensional enterprise, with each activity relating to others in several different ways. No matter how the activities may be grouped and arranged in a map of educational R&D, as they are into program elements and areas in the tentative program, overlaps and close relationships will appear among activities listed separately. Thus, for example, the development of certain kinds of experimental schools is listed at several places in the tentative program. This simply reflects the fact that such a school may serve several R&D objectives; it is not meant to suggest that separate, but identically defined, experimental schools should be run as part of each program element. However, program development must identify and assign clear responsibility for these multipurpose activities. *To emphasize the interrelationships among educational R&D activities, the tentative program listing cross-references related activities through "related to" entries in many activity descriptions.*
- *Develop cost, manpower, and time estimates for activities.* A valid program cannot be developed without sufficient information to face the real constraints of funds, time, and manpower.
- *Identify specific objectives for program elements.* Especially in the case of Program Area I, general statements of objectives--such as, to improve the education of the disadvantaged--are

insufficient to guide program design. The definition of specific objectives is prerequisite to the development of a coherent program.

- o *Develop alternative plans for each program element.* From the listing of possible activities, with associated cost, manpower, and time requirements, a series of alternative R&D plans (for different total cost figures) could be composed to achieve the specific objectives. This procedure would be most specific in Program Area I, less specific in Program Areas II and IV, and least specific in Program Area III.
- o *Make program choices.* On the basis of this detailed information, the program design choices described earlier can be made.

Thus, the tentative program listing that follows should be viewed only as a beginning. Development of an improved *Agenda for Educational Research and Development*, involving a wide range of consultation and extensive data gathering, should be the next step in preparation for the NIE.

PROGRAM ELEMENT I-1: IMPROVING EDUCATION OF THE DISADVANTAGED

Nature of the Problem

Disadvantage Before School. Blacks, Puerto Ricans, Chicanos, American Indians, and whites growing up in poverty generally enter school behind their middle-class fellow students in measured achievement and readiness. They usually leave even farther behind.

Disadvantage in School. In school, children from disadvantaged backgrounds have a variety of difficulties in coping with the standard school curricula and attitudes. The difficulties often lead to failure on standardized tests, poor self-images, lack of interest in school, boredom, inattention, disruption, violence, and withdrawal from education.

Disadvantage After School. Too many from disadvantaged backgrounds leave school without competence in the basic cognitive skills, without marketable career skills, without confidence in themselves and their capacity to learn, and without a proper understanding of the society in which they will live. The result is a lifetime trapped in disadvantage, and a new generation of children born to it.

Possible Causes

Among the possible factors contributing to educational disadvantage are:

- o Early home conditions that hamper psychological development.
- o Insufficient verbal and intellectual stimulation in early years.
- o Home and neighborhood cultures different from those of the majority (and the schools).
- o Language difficulties arising from use of a different language or nonstandard dialect outside of school.
- o Inappropriate curricula from the standpoint of relationship to child's experience, ability to develop his interest, reliance on books rather than experience, and so on.
- o Effect of narrow measures of capability and development on student morale and teacher expectations.

- o Inadequate motivation provided by family, peer-group, school, or society to lead student to believe that school success is desirable.
- o Insufficient information available to teachers on special needs of disadvantaged and on programs that have been more successful than most.
- o The unmet need for more intensive instructional programs than are generally provided.

Program Activities

A coherent R&D program attempting to alleviate the educational deficiencies of the disadvantaged must address many of these possible causes and comprise activities ranging from research, through development, experimentation, and assessment, to implementation. Among the program's constituents might be:

1. *Basic studies,* by behavioral and social scientists (including educationists), of the causes and nature of educational disadvantage and of special characteristics of the learning process among disadvantaged children:

- o What motivates disadvantaged students to learn--and what discourages them?
- o What is the nature and extent of extraschool learning from television, friends, family?
- o What are the effects of nutritional deficiencies on learning?
- o How do dialect or first-language differences affect learning?
- o What is the extent and degree of disadvantage? How is it distributed?

(Related to III-1, III-2, III-3.)[1]

2. Pilot *curriculum development and research programs* producing materials directed at the needs of the disadvantaged, such as:

- o New or modified curricula in the arts, sciences, and humanities

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[1]Where related activities are suggested under several program elements, they will be cross-referenced through "Related to" entries of this form. The entry III-1 refers to all of program element 1 in program area III. The entry III-1.2 refers to the activity number 2 in that element.

responsive to the needs and interests of the disadvantaged. For example, history courses that more adequately cover the roles of Blacks, Chicanos, and Indians in the development of America; literature courses that employ materials of contemporary interest to draw the student into the continuity of literary development; science courses that help the student to understand the urban environment. (This activity should be undertaken in cooperation with the NSF and the National Foundation on the Arts and Humanities.)

- o Materials and procedures for increasing the sensitivity of students and teachers to the problems and needs of others--for example, films presenting specific human-relations problems to be discussed in class; reading and writing activities designed to foster understanding of others.
- o Further development of television programs--on the model of *Sesame Street*--that teach *and* interest youngsters.
- o Curricula, perhaps employing technology extensively to facilitate self-study, to help postsecondary students from disadvantaged backgrounds overcome prior deficiencies in reading, mathematics, and so on.

(Related to I-2.2, II-1.4.)

3. A comprehensive program on *early childhood education* (in cooperation with the Office of Child Development, NSF, and NIH), seeking improved ways of giving each child a proper start before elementary school:

- o Basic studies of cognitive, emotional, and social development from birth.
- o Development of improved materials for teaching parents and prospective parents about the ways children develop intellectually and socially and how to help them. (These might include courses for use in high school, television programs, books, neighborhood center programs, adult education, and toy libraries.)
- o Development (and evaluation) of curricula and programs for day-care centers.

(Related to III-1, III-2, III-3.)

4. A program of *experimental schools* established to try out in practice a variety of alternative forms of education for the disadvantaged. The schools would have normal (and comparable) school populations, be provided with additional funds and staff for planning and development activities, and pay careful attention to comparative evaluation. School personnel would work closely with community people and R&D staff from universities and educational laboratories. Some experiments might be:

- o A school on the model of the informal British primary schools in which a rich environment, physical objects, and interesting activities provide strong motivatio for learning.
- o A school making extensive use of television and computer media to provide flexible, individualized instruction.
- o A school with heavy community involvement in control, teaching, curriculum, personnel, and disciplinary matters.

(Related to I-2.1, II-2.1, II-2.3.)

5. Development of *new measures of educational achievement*, including:

- o Measures of student capability that do not penalize the student because of cultural differences.
- o Measures of noncognitive qualities--self-confidence, responsibility, leadership.

(Related to II-3, III-1, III-2.)

6. *Transmittal of the results of R&D to teachers and school administrators* thro gh mechanisms such as:

- o Development of curricula on education of the disadvantaged for teacher-education institutions and in-service programs.
- o Cooperation with the NSF and with OE's Bureau of Educational Personnel Development in encouraging participation by teachers in curriculum development projects along the lines of the very successful British Schools Council.
- o Development of brochures, books, films, magazines, and other materials on effective education of the disadvantaged.

(Related to I-3.5, II-4, III-2.7, IV-3, IV-4.)
Programs 1 through 6 represent, but do not delimit, the kinds of activity that an effective program would have to undertake. The precise choice of activities and the design of the linkages among them must await a careful program design activity. Note, however, that these programs span the range from basic research, through development, experimentation, and assessment, to innovation.

PROGRAM ELEMENT I-2: IMPROVING THE QUALITY OF EDUCATION

Nature of the Problem

Failure to Excite Students' Interest. Students from the whole range of abilities, social backgrounds, and educational levels are finding much of standard educational fare irrelevant to their needs, their interests, and their perceptions of the world.

Failure to Provide a Wide Enough Diversity of Educational Choices. Despite the wide variety of individual needs, interests, and learning styles and the differing aspirations of parents and communities, school and college programs are remarkably alike throughout the country. Parents and students usually have no choice among schools and little possibility of choice within the assigned school. In a society that celebrates the diversity in its marketplace, there is virtually no choice in the schoolroom.

Failure to Serve the Career Needs of Many Students. Too many students leave the formal educational system unequipped or ill-equipped for work. Their courses have failed to prepare them to handle the real problems they will encounter on the job; have steeped them in present or outmoded knowledge without preparing them to adapt to the inevitable changes; and have not given them sufficient information on which to base career choice. Moreover, despite the growing need for continuing education during careers, for reeducation to new careers as society's needs change, and for postponed career education by those who choose motherhood or other experiences first, the education system makes only inadequate and haphazard provision for continuing career education.

Failure to Develop Effective Methods of Instruction. Despite the experience of other national enterprises in which new technologies and new procedures have combined through the years to raise effective productivity, education's "technology" remains almost unchanged from what it was at the beginning of the century. Although experimentation with new methods, materials, and media has been carried out, it has had little lasting effect on the classroom.

Program Activities

Among the constituents of a coherent R&D program might be:

1. A program of *experimental schools* in which are tried new methods of education, intended to stimulate and exploit the interests of the students. Among them might be:

- o A school with opportunities for students to work "off campus" in a job or project related to their interests.
- o A school combining self-paced study with classroom study with inside-the-school jobs in a mixture that changes as students' needs and maturity change.
- o A school that breaks down the barriers between school and community by taking students out into the community and by bringing community people into the schools.
- o A school that employs technology freely and creatively to provide the teacher with new tools and to free students from the academic lockstep.
- o A school that employs student interests in socially desirable enterprises as a means of organizing learning activities.

(Related to I-1.4, II-2.1, II-2.3.)

2. An extensive program of *curriculum development*, in cooperation with the NSF and the National Foundation on the Arts and Humanities, to insure that for each subject in the elmmentary and secondary curricula there are several sets of materials available that:

- o Have involved persons at the forefront of knowledge or art in their development (so that the excitement of contemporary application and the approach to emerging problems will be included) as well as classroom teachers (so that children will indeed experience that excitement).
- o Have provided for individualization with regard to students' interests and learning style.
- o Have made full use of new technology and media to extend possibilities, improve learning, and assist teaching.

(Related to I-1.2, II-1.4.)

3. Support for *experimentation with new forms of education* intended to serve better the needs for various forms of career education, including:

- o Programs that phase the transition from school to work over the late-teen years, gradually decreasing school attendance.
- o Programs held at work sites in conjunction with employers and unions.
- o Programs (especially in higher education) relying on extra-school instruction employing the new instructional technologies and independent certification via formal examinations by accredited agencies. (This concept is now referred to as the "External Degree.")
- o Programs viewed by student and school or college as extending over the student's full career, enabling him to reenter his institution whenever he has the need and opportunity.

(Related to II-2.1, II-2.5, III-3.4, III-3.6, III-4.2, III-4.3.)

4. Exploration through research and experimentation of better ways of *linking individual and community needs, educational objectives*, and *school services*. This might include rather basic studies of the possible objectives of education and its current success in achieving them, as well as support for community efforts to define local educational objectives. It might also include experiments with various linkages between community and schools to determine the advantages and disadvantages of each. In support of such experiments would be studies of various forms of educational governance, of measurement of educational performance, and of experience in other countries.
(Related to I-3.4, I-3.5, II-2, II-3, III-2, III-3.)

PROGRAM ELEMENT I-3: IMPROVING THE EFFECTIVENESS OF RESOURCE USE IN EDUCATION

Nature of the Problem

Reduction in the Rate at Which New Resources Are Made Available. Voters in many states and communities have rejected bond issues and budget increases; many school districts have been forced to eliminate programs or to shorten school sessions. Both public and private higher education institutions are finding their sources of funds shrinking.

Increases in the Costs the Education System Must Pay. Teacher salaries, which are by far the largest part of educational costs, are rising without comparable increases in teacher productivity. Other expenses are subject to the general inflationary trend. When introduced, new materials and technology ordinarily increase, rather than reduce, the cost of education.

Increasing Demands for Service. While resources remain relatively fixed, demands for the schools to provide new services to additional clientele at higher quality add to the job that must be done and increase costs.

Inadequate Knowledge and Methods to Achieve Most Effective Resource Use. Data concerning the relationship between educational inputs and educational output are virtually nonexistent. School officials cannot easily estimate effects of changes in input expenditure on output. Many decisions are dictated by "traditional" rules of thumb unsupported by evidence.

Program Activities

1. A research program to develop better *information about current educational resource use and constraints*, including studies of staffing patterns, personnel policies, and contract provisions; use of technology and materials; utilization of facilities.
(Related to II-1.1, II-1.5, II-1.6, II-2, II-3, II-4.1, III-2.4, III-2.7, III-3, III-4.)

2. A program of studies of *educational finance* intended to provide a firmer basis for public decisions. Among the activities might be:

- o A study of alternative forms of Federal support to higher education.
- o Investigation of the interrelations among Federal, state, and local support of elementary and secondary education.
- o A study of the influence of various categorical aid programs on the flexibility and efficiency with which schools expend their resources.

(Related to III-3.1, III-3.2, III-3.3.)

3. Experiments with new forms of *resource utilization*, such as:

- o New staffing arrangements for carrying out the range of educational tasks, including use of students as tutors and teachers, differentiated staffing, and employment of paraprofessionals.
- o Greater use of technology to allow the teacher to command the same range of technical aids as persons in other professions and thus to achieve higher quality and productivity.
- o Greater use of less-expensive classroom equipment so that more can be bought with limited budgets; greater use of inexpensive materials in the classroom; and more use of the natural or man-made environment outside the classroom as a teaching laboratory.
- o Provision of buildings through rental or joint-use construction. Encouragement of year-round, night and weekend building use for educational activities serving the adult and part-time student communities. Use of remodeled older buildings and storefronts for schools.

(Related to II-1, II-2, II-4, III-4.)

4. Development of new *aids to effective school decision-making* in cooperation with a number of school districts. This program might include a number of activities aimed at improving the data and methods employed in making school decisions. Among these might be:

- o Design and experimental implementation of a computer-based

school information system to provide decision-relevant data on school costs, student performance, and teacher roles.

- o Development of accounting and budgeting systems for schools and school districts that will associate input costs with specific school programs.
- o Adaptation of analytical techniques from operations research and systems analysis to school decision problems.
- o Research on the relationships between school inputs and school outputs for various school populations so that guides to effective resource use can be developed.
- o Development and test of evaluative techniques through which school managers can analyze their systems' performance and locate potential problem areas.

(Related to I-2.4, II-1.1, II-1.6, II-2, II-3, III-3, III-5, IV-1.2, IV-2.2, IV-3.)

5. Experimentation, research, and development on *incentives for effective resource allocation.* Since it is often asserted that school systems lack strong incentives to be effective in resource use, this program would include several studies addressed both to better understanding of existing incentives and to design of improved incentives:

- o Research on existing incentives affecting resource use that are offered to teachers, students, and school systems. The effect of the provisions of various state and Federal funding programs would be of special interest.
- o Development and testing of new forms of school governance affecting resource-use incentives; examples include school-to-community accountability, performance contracting, and competitive schools.
- o Experimentation with greatly increased teacher responsibility for classroom decisions (including allocation of budget, choice of equipment, aids, etc.) and for consequent performance.

(Related to I-1,6, I-2.4, II-2, II-3.1, III-2.4, III-2.7, III-3.2, III-3.3.)

PROGRAM ELEMENT II-1: IMPROVING THE INSTRUCTIONAL PROCESS--CONTENT AND METHOD

Area of Concern

The instructional process is the center of education. Its effective accomplishment is the reason for everything else. It is the point where learner and instructor, subject matter, method, media, and materials come together. The art and science of that combination should be the primal subject of educational R&D.

The process attains seemingly infinite complexity. The possible number of distinct combinations of student characteristics, teacher characteristics, subjects of study, teaching methods, media, and materials is astronomical. Yet for each different combination of student, teacher, and subject there may be a different combination of method, media, and materials that is most effective. As a result, most studies proceed by holding almost all factors constant and varying only one or two. Not surprisingly, most studies fail to show significant difference or to attain significant generality.

Nevertheless, careful cumulative efforts to increase understanding of the instructional process are essential to the quest for fundamental progress in education. Understanding of the incremental influences of each controllable factor must be sought. What are the effects of different teaching styles? How can new media be used effectively? What curriculum improvements can be made for a specific subject matter? Some factors or combinations of factors will have greater effect than others. They should become the foci of major efforts.

Program Activities

Among the programs that might be included in this program area are:

1. Research to determine how the various *school inputs affect school outputs*. Studies of this kind have been given impetus by Coleman's study, *Equality of Educational Opportunity*. Using various sources of data, studies have attempted to determine through statistical techniques which factors (student background, teacher characteristics,

school facilities and supplies, etc.) affected student achievement on standardized achievement tests. While a fair amount has been learned, weaknesses in available data and evaluation instruments, and the narrow range of schooling situations have inhibited progress. A careful program of this kind might be linked with the experimental schools so that longitudinal data from a wide range of schooling situations could be attained. From such studies would come better information about which factors in the instructional process offer the greatest leverage for improvement.
(Related to I-3.1, I-3.3, I-3.4, II-3, III-5.)

2. Research on *teacher styles and strategies*. A fair amount of effort is going into studies of the minute-by-minute tactics of teaching. Studies should also be undertaken of the larger strategic decisions by which a teacher's entire approach to a class and subject are shaped. What distinguishes the teaching styles of those teachers who have achieved success with disadvantaged children? How can teaching styles be described and evaluated?
(Related to I-1.6, II-4.)

3. Research into *curriculum development practices*. Considerable experience with the development of new curricula has been obtained during the past dozen years, especially in the sciences and mathematics, as a result of NSF sponsorship. Future efforts at curriculum development and, especially, the training of development personnel would be aided by a careful attempt to study and distill this experience.
(Related to IV-1.3, IV-2.2.)

4. *Development of curricula*. Although curriculum development is proposed as a central activity in the program areas concerned with the disadvantaged and the quality of education, it also should form a part of this program area. Here, however, the emphasis would be on curriculum developments that extend the instructional process by, for example, relying heavily on new technology (cassette or cable television, computers, audiovisual cassettes, etc.) or using different teaching methods, innovative school settings, or unique subject matters.
(Related to I-1.2, I-2.2.)

5. *Development of technology and media.* This program would support efforts intended to develop effective instructional tools employing contemporary technology. For example, it would experiment with modes of use of cassette television in and out of school; with computers as aids in higher and continuing education; and with broadcast television in conjunction with these other technologies. It would pay special attention to adapting new communication technologies to provide access to education to those outside the formal educational system.
(Related to I-3.1, II-2.1, II-3.3, II-4.6, III-4.)

6. An *experimental program* examining a wide range of alternative mixes of students, teachers, subjects, methods, media, and materials to develop better understanding of their interrelationships.
(Related to I-3.1, II-2.1, II-3.4, III-1, III-2, III-4, III-5.)

PROGRAM ELEMENT II-2: IMPROVING THE EDUCATIONAL SYSTEM--ORGANIZATION AND ADMINISTRATION

Area of Concern

The educational system provides the matrix in which the instructional process occurs. That matrix determines to a large extent the amount and pace of instruction, the structure of classes, the incentives seen by students and teachers, the allocation of resources, and interaction with the community.

One major system question is, *What forms should education take?* The traditional form in which fixed-size classes move grade-by-grade through a specified series of courses and examinations under the tutelage of a sequence of individual instructors at a special place (called a "school" or a "campus") is being challenged by changing circumstances and clientele. Careful experimentation with and evaluation of alternative forms of education, including new types of educational institution, are required.

Whatever form is employed, the need to organize and administer it effectively will arise. Objectives must be set, personnel selected and evaluated, resources allocated, curricula chosen, progress determined, rules and sanctions developed. So a second system question is, *How can alternative forms best be organized and administered?*

The education system itself exists within a larger matrix--society. Its success depends, in the end, on how well it meets society's needs, including those of individual members. A third system question then is, *What should be the relations between the education system and the community?*

Program Activities

1. A series of *experiments with widely varying forms of education* including, for example:

   - o Schools that combine instruction with employment.
   - o Schools with higher-than-usual pupil/teacher ratios but much greater use of self-study methods and technologies.

- o Schools that partake actively of the community and operate from storefronts, old buildings, and the like.
- o Schools that mix age-groupings and use older students to help younger ones.
- o Schools without grade reports, but which require mastery of a topic before the next one can be begun.
- o Education outside of the regular schools, certificated by state or national examination programs.

(Related to I-1.4, I-2.1, I-2.3, I-2.4, I-3.1, I-3.3, I-3.5.)

2. Development of *improved management techniques*. Some of this work would, of course, be undertaken as part of the program area concerned with effective resource use. However, the interest here would be in the wider-range and longer-term activities not having so explicitly a resource-effectiveness payoff. Activities might include:

- o Development of improved cost-analysis and budgeting procedures.
- o Analysis of alternative personnel and salary policies and their consequences for teaching effectiveness.
- o Development of procedures for achieving reasonable "accountability."

(Related to I-3, II-3, III-3.)

3. *Experimentation with and evaluation of forms of governance.* The increased militancy of students and faculty and changing social mores have given rise to demands for changes in school and college governance. This program would study these changes, identify the range of possibilities, and review the experiences of these natural experiments as a guide to further changes. When appropriate, it would also support experiments with previously untested forms.

(Related to I-1.4, I-2.1, I-2.3, I-2.4, I-3.5, II-3.1, III-2, III-3.)

4. A program to *evaluate experiments in establishing closer school/community relations* through such devices as decentralization and local school boards, accountability, and the introduction of incentives and market features.

(Related to I-2.4, I-3.5, II-3.1, III-2, III-3.)

5. Experimentation with methods of widening the range of *extra-school education.* This program would seek to develop education systems to serve the needs of:

- o Women past child-rearing age who would like career training.
- o Midcareer workers who would like to enter a new career or upgrade their skills significantly.
- o The older disadvantaged who would like to overcome the deficiencies of prior schooling.

(Related to I-2.3, I-2.4, III-3, III-4.)

PROGRAM ELEMENT II-3: IMPROVING EDUCATIONAL ASSESSMENT--MEASUREMENT AND EVALUATION

Area of Concern

Assessment is the provision of information about the performance of the educational system to assist in educational decision-making--at all levels of education. If assessment procedures are narrow or imprecise, the information will be incomplete and the decision may be mistaken. Progress in the development of assessment procedures, then, affects the rate at which educational decisions can improve. At the same time, assessment depends on some indication of educational goals and objectives to guide what is to be assessed. If assessment procedures do not respond to a careful identification of the relevant goals and objectives, then decision may be misguided. Progress in the development of assessment procedures, then, affects the direction of educational improvement.

There are many kinds of assessing that must go on in education. Among them are measurement of student and teacher qualities; evaluation of the effect (on the average) of an educational program; measurement of individual student progress; evaluation of the effect (on the average) of an educational institution; and evaluation of the effect of a Federal or state program of educational support. Moreover, there are many criteria or objectives that might be considered in each measurement or evaluation, and there are several different kinds of decision (with different information needs) that each one might serve.

Thus, a national program of research and development in assessment must push a very broad frontier forward. A major portion of the NIE's intramural program should be devoted to this area of concern, since assessment is central to the illumination of major educational problems and to the wide-ranging examination of the state of education.

Program Activities

1. Development of *techniques and procedures for assisting in the identification of educational goals and objectives and reporting on*

progress toward their attainment. The heightened concern for making education more responsive and responsible to its clientele--the students, the community, the society, has increased the ever present need to identify the goals and objectives that each part of the educational system should be serving. The drive for "accountability" in local schools, for example, raises the following questions: How can a community develop and express goals for its local schools? What are the advantages or disadvantages of ballots, questionnaires, or elected representatives as means of determining community goals? How can progress toward the attainment of goals best be reported? What instruments exist for which goals? Toward which goals must progress be evaluated judgmentally? How should results be adjusted to reflect differences in home and student characteristics? What other analysis and interpretation is desirable? What procedures for presentation of the results to the community are appropriate?

There are analogous questions for assessment of the performance of other constituents of the educational process: Federal programs, state programs, local programs, curricula, teachers, students. (Related to I-2.4, I-3.4, II-2.2, II-2.3, II-2.4, III-2, III-3.)

2. Development of *techniques and instruments for evaluating a far broader range of education results* than are commonly considered. Among the requirements are:

- o Methods for assessing psychological development, cognitive and motivational, that are independent of interpersonal comparison, age, and cultural background.
- o Methods for assessing learning outcomes referenced to objectives, that are independent of interpersonal comparison, age, and cultural background.
- o Methods for assessing social development, that are independent of interpersonal comparison, age, and cultural background.
- o Methods for assessing the development of learning skills and incentives.

Techniques should also be developed for identifying and measuring some of the reasonably objective consequences of educational programs on

society, and some of the educational effects of outside-the-school influences--family, friends, television.
(Related to I-1.5, I-2.4, I-3.4, II-1.1, II-1.6, II-2.2, III-1, III-2, III-5.3.)

3. Development of *new procedures for evaluation* that go beyond the application of traditional measuring instruments. Among the possibilities here are:

- o Computer-based examinations that adapt the sequence of questions presented on the basis of student responses and that permit realistic problems to be presented with reasonable economy.
- o Anthropological field-study techniques that identify the nature of changes in the social behavior of students and teachers, both in school and outside.
- o Longitudinal data-gathering on a variety of groups of students passing through various educational experiences that can help to identify long-term effects of education and, if repeated regularly, long-term changes in the educational process.
- o Resource-effectiveness evaluations that explicitly determine the resource inputs associated with effectiveness outputs so that alternative programs may be compared in terms both of resource use and effectiveness.

(Related to III-5.)

4. Development of *principles for evaluation of important classes of educational activity*. The state of evaluation methodology for many types of educational activity is primitive. Nevertheless, the demand and need for such evaluations is high. The NIE could help considerably by supporting the development of procedures for evaluating:

- o Federal education programs, especially multiagency programs having broad, national impacts.
- o Educational experiments, both planned and "natural," so that essential information may be obtained from experience with educational variations.

- Extraschool educational influences, both positive and negative.

(Related to I-1.4, I-2.1, I-2.3, I-2.4, I-3.2, I-3.3, II-1.1, II-1.6, II-2, III-3, III-4, III-5.)

5. *Evaluation of ongoing evaluations* and the development of standards for good and relevant evaluation. This activity (and the preceding one) might sponsor exemplary evaluations or provide guidance on appropriate reporting standards. It should include studies of data security and privacy relating to measurement and evaluation. Who should have access to what data under what conditions?
(Related to IV-1, IV-2, IV-3.)

6. Development of programs for the *training of educational evaluators*. The NIE might both sponsor the development of educational programs for the training of evaluation personnel and provide support for the training of evaluation research personnel. (These activities would be carried out in cooperation with OE's Bureau of Educational Personnel Development.)
(Related to II-4, IV-1.)

PROGRAM ELEMENT II-4: IMPROVING THE EDUCATION OF EDUCATIONAL PERSONNEL

Area of Concern

In the final analysis, educational improvement--at all levels--depends on changes in the way faculty teach and administrators administer. Unless R&D results are used to modify classroom and school practices and affect instructor and administrator behavior they will be for naught. Thus, the teacher-education system (including the graduate schools, which educate college and university faculty) should be a principal *consumer* of educational R&D results. But teacher education itself demands improvement, in the same way that other school and college education does, so the teacher-education system must also be a principal *subject* of educational R&D.

The central questions are: What educational experiences do different kinds of educational personnel--at every level of education--need before and during their years in the school and classroom? How can teachers be equipped to identify individual student needs and be provided with a wide repertoire of responses to those needs? How can teachers and administrators be provided with the knowledge and competence constantly to review their approach to education as circumstances and requirements change? How can educational personnel be prepared to participate in and employ the findings of R&D? How can the capacity of colleges and universities which prepare the nation's teachers be strengthened to bring about these changes?

The work in this program element would be carried out in close cooperation with the OE Bureau of Educational Personnel Development and the NSF.

Program Activities

1. Development of *techniques for the identification and selection of effective teachers*. Are there common intellectual and motivational characteristics of effective teachers? Can individuals who have the capacity to become effective teachers be identified before they enter

teaching? Can procedures for the selection of such individuals be developed? What techniques--strategic and tactical--do effective teachers use? Can they be conveyed to other teachers? Can methods of evaluating teaching proficiency be developed? Similar questions may be asked about administrators, teacher aides, and so on. (Related to I-3.1, II-1.1, II-1.2.)

2. A continuing *review and evaluation of teacher preparation.* This activity would examine and project national needs for educational personnel; examine existing programs for meeting those needs; and identify needs for further R&D to improve the education of educational personnel. It would undertake a variety of evaluations of teacher (and administrator) education programs, here and abroad, with regard to their preparation of educational personnel for the tasks they will face in the schools.

3. *Development of markedly different materials for the preparation of educational personnel.* A wide range of materials development options should be explored, including:

- o The use of media and technology to record practical teaching situations and styles for examination and review during the preparatory program.
- o The creation of simulated classroom situations that enable teachers to develop teaching skills under realistic conditions.
- o The use of media and technology to provide instructional modules for independent use by teachers, before and during service, to learn specific knowledge and skills.

(Related to III-4.)

4. Experimentation with *new forms of teacher education* that:

- o Attempt to link training, research, and practice more closely through association between colleges and universities and local schools, which serve as sites for student teaching internships, R&D, and innovative teaching practice.
- o Involve prospective teachers in the practice of teaching from their first year of higher education and onward.

- o Employ the same kinds of innovative methods in teaching teachers as teachers are taught to use.
- o Attempt to develop the attitudes and skills that will enable teachers continually to examine and improve their teaching practices throughout a 20- or 30-year career, including an awareness of the findings, concerns, and uses of educational R&D and an ability to participate in R&D activities.

(Related to I-1.6, IV-3.)

5. Investigation of improved ways to *tie the findings of educational R&D to teacher preparation and refreshing*. One critical link in the path from knowledge to practice is the one that transmits the knowledge to teachers in a form that they can use. This must occur during precareer training and, for most teachers, during practice. This program would experiment with various ways of doing this, attempt to evaluate their relative effectiveness, and use the result to help design improved systems of teacher training.

(Related to I-1.6, IV-4.)

6. Development of *educational programs for new educational careers*, including:

- o Paraprofessional teacher aids.
- o Teachers who specialize in preparation of curricula for use with the new technologies and who, like film and television artists, are sensitive to the demands and potential of those technologies.
- o Educational "extension agents" who convey the findings of educational R&D to practicing teachers.
- o Education evaluation specialists who can design and implement evaluation schemes for new educational programs.

(Related to I-1.6, I-3.3, II-3.6, IV-1, IV-3, IV-4.)

PROGRAM ELEMENT III-1: INCREASING THE KNOWLEDGE OF THE INDIVIDUAL AS A LEARNER

Topics of Concern

An understanding of the individual learner is central to education. Advancing that understanding is a concern of several of the social and behavioral sciences. In these areas of basic science, the specification of research projects properly is left to the scientists who must carry them out. Rather than list such specific activities here, then, a number of areas in which activity should be supported are identified:

1. *The biology of learning.*[1] Studies of the biophysics and biochemistry of brain function; genetic factors affecting intellectual activity.

2. *The development of the child.* Studies of the stages of mental and physical development; external influences on development. The effects of pre-natal and peri-natal environmental influences on mental development.

3. *Language acquisition and use.* Studies of the process of learning a language; relationships between language and other mental functions.

4. *Perception and memory.* Studies of the process of gathering, structuring, and storing information from the environment; relationship to learning.

5. *Information processing.* Studies of the ways humans manipulate information: reasoning, creativity, pattern recognition.

6. *Motivation.* Studies of the factors that affect the individual's desire to learn and use his knowledge.

7. *Individual differences.* Studies of the ways in which individual learners differ, the causes of those differences, and how the differences may be identified.

8. *Deficiencies, abnormalities, and pathologies.* Studies of the various types of emotional and intellectual disturbances, their sources, and remediation or alleviation.

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[1] Since activities in Program Area III are relevant to most of the activities in Program Areas I and II, no specific cross references are given for them.

PROGRAM ELEMENT III-2: INCREASING KNOWLEDGE OF GROUP PROCESSES AS THEY AFFECT LEARNING

Topics of Concern

The individual learner is not really that. He is, rather, a member of many groups, each of which exerts influences on his desire and ability to learn. The understanding of such influences is the concern of several of the basic sciences. Among the areas that the NIE should support are:

1. *Peer-group influences on learning.* Studies of the role of peer attitudes and pressures on individual motivation and achievement; the role of formal mechanisms (competition, cooperation) and informal mechanisms ("everyone goes to college").

2. *Family influences on learning.* Studies of the role of family attitudes and pressures on individual motivation and achievement; differences attributable to differences in family composition and character.

3. *School influences on learning.* Studies of the role of teacher attitudes and pressures on individual motivation and learning; the role of relations among learning individuals.

4. *Socialization/acculturation.* Studies of the processes by which individuals adopt and accept the shared assumptions of a group, culture, or society; factors that favor or hinder such processes.

5. *Formal educational organizations.* Studies of group processes as they affect the functioning and management of schools; student, teacher, administrator relationships and how they change with student age; effects of school organizations on learning.

6. *Group norms and sanctions.* Studies of the processes by which formal and informal groups develop and enforce norms; factors that lead individuals to adhere to or deviate from group norms.

7. *Racial, social class, and economic factors in group behavior.* Studies of the ways in which individual differences affect group formation and maintenance; intragroup and intergroup conflict and individual differences; effects of prejudice.

8. *Group influences on innovation.* Studies of the inhibitory or supportive effects of group pressures on the process of change; groups and their influence on educational innovation.

PROGRAM ELEMENT III-3: INCREASING KNOWLEDGE OF SOCIETAL INFLUENCES ON EDUCATION

Topics of Concern

Education is a central function of society. Through education society transmits to the new generation the knowledge, values, and skills brought forward from previous generations and developed by the present one.

Through education society meets its needs for trained manpower and a competent citizenry. There is then a close and complex relationship between society (broadly construed to include politics, economics, and culture) and education. Studies of that relationship are the concern of several of the social sciences. Among the areas that the NIE should support are:

1. *Economic benefits of education.* Studies of the contribution of education to the economy through increases in human capital; education as a productive factor; individual and societal gains from education.

2. *Educational finance.* Studies of the economic reasons to support education; alternative support mechanisms; costs and benefits of various mechanisms for various population groups.

3. *The governance of education.* Studies of the forms of governance of education; the role of special-interest groups; state, local, and Federal government roles.

4. *Social change.* Studies of the effect of rapid social change on the forms and content of education; the school as a mechanism of social change.

5. *Race and schooling.* Studies of the influence of racial factors on access to and benefits from schooling.

6. *Nonschool education.* Studies of the effects of nonschool educational influences, such as TV, film, newspapers, on the intellectual and social development of students.

7. *Education and societal needs.* Studies of the processes by which education does or does not adjust to provide the skills and knowledge

needed by society or its members; social incentives that affect education.

8. *Objectives of education.* Studies of the appropriate objectives for education in contemporary American society.

9. *History of education.* Studies of the development of educational ideas and of the experience of previous generations and societies with various forms of education.

PROGRAM ELEMENT III-4: INCREASING THE ABILITY TO USE TECHNOLOGY AND MEDIA EFFECTIVELY IN EDUCATION

Topics of Concern

Technology has revolutionized many of society's functions; not so, education. Despite the evident potential of the new communications and information technologies, the effective use of television, computers, and allied media is almost nil in American education. The reasons for this deficiency are unclear. Nevertheless, the potential benefits from the technologies are so high that careful efforts to develop them are warranted. In addition, further efforts to develop the conventional audio and visual media are justified, especially with the greater convenience now offered by audio cassettes and 8-mm film loops. Other technologies of interest to education include those used to create the instructional environment--buildings and equipment. Studies and development of the media and technologies are the concern of basic scientists, technologists, and artists. Among the areas the NIE should support are:

1. *Instructional uses of the computer.* Studies and development of improved uses of the computer in instruction; exploitation of time-shared centralized and cassette-programmed minicomputers; implications for nonformal education of computer-based instruction. Close cooperation with the NSF would be maintained.

2. *Cassette television and cable television.* Studies of the potential of new television technologies for education; roles in formal and nonformal systems; validation and certification of education received via television outside of a formal system.

3. *Course production for television.* Experimentation with new institutional forms, like Children's Television Workshop, that can create high-quality materials for the new media; creation of new courses based primarily on the new media, including combinations of the computer and television.

4. *Games and simulations.* Studies of and development of various forms of games and simulations for instructional uses; investigations of strengths and weaknesses.

5. *Instructional environment.* Studies of desirable environments for learning; design of improved buildings and equipment.

PROGRAM ELEMENT III-5: INCREASING THE EFFECTIVENESS OF ANALYTICAL TOOLS AND METHODOLOGIES

Topics of Concern

Many educational and education R&D activities depend on analytical and research methodologies provided by the computational and logical sciences: mathematics, statistics, philosophy, and computer science. Some effort should be devoted by the NIE to the encouragement in these sciences of developments needed in education. Among the areas the NIE might support are:

1. *Statistical techniques* for the estimation of complex, multivariable, time-dependent relationships when many independent variables are highly correlated, such as those that obtain in many educational systems.

2. *Computer-based techniques* for storage and retrieval of large quantities of data on individuals, under proper security and privacy safeguards, and for convenient analysis of those data.

3. *Logical analysis of fundamental concepts of measurement.* Study of categories of measures; their proper roles; their characteristics; and fallacies of measurement.

PROGRAM ELEMENT IV-1: DEVELOPING A SUPPLY OF COMPETENT R&D MANPOWER

Types of Activity

A significant impediment to further development of an effective system of education R&D is the insufficient availability of appropriately skilled manpower. This is a problem not only of numbers, but also of maldistribution with respect to style (researchers, developers, evaluators), skill (psychologists, economists, operational analysts, historians), and situation (universities, Regional Laboratories, state and local agencies). The manpower development program of NIE should include activities intended to identify and redress these insufficiencies and maldistributions. Among the activities might be:

1. *Manpower requirements.*[1] A group should be formed within the NIE to support and conduct studies of the needs of the educational R&D system for manpower having various styles, skills, and situations and to develop programs intended to meet those needs. (This must be done in close conjunction with planning of the overall R&D program.)

2. *Training programs for state and local agency staffs.* One severe deficiency of the existing R&D system is the insufficient number of staff members in state and local agencies who are able to enlist R&D competency in the service of educational practice. This could be overcome with the help of training programs aimed at the needs of such staffs.

3. *Development and evaluation specialist training.* Another major deficiency is the shortage of individuals trained in educational development, evaluation, and other applied activities. The NIE might encourage joint programs between educational development and evaluation organizations and universities to train such specialists. Participation in development and evaluation activities should be an essential part of the programs.

4. *Postdoctoral fellowships.* The field of education needs to attract the close attention of a wide range of skills and disciplines.

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[1] No specific cross-references are provided for activities in Program Area IV.

One way to expand quickly the number of highly trained individuals who are knowledgeable about and interested in education might be to offer postdoctoral fellowships to qualified individuals with doctorates in relevant fields such as psychology, economics, sociology, or computer science. The fellowships would require residence at an institution having an active educational R&D program; many might be at the NIE itself.

5. *Doctoral fellowships*. An expanded program of fellowships to graduate students training for educational R&D might be undertaken. These should, however, be tied closely to the existence of high-quality R&D activities at the training institution *and* participation by the fellows in those activities. These fellowships should be available to students with interests in education in any school or department of the university.

6. *Special training programs*. Certain manpower needs might best be met through apprenticeships, on-the-job training, or short-term intensive training programs at full salary.

PROGRAM ELEMENT IV-2: DEVELOPING A SUPPLY OF EFFECTIVE R&D INSTITUTIONS

Types of Activity

Another impediment to development of an effective system of education R&D is the inadequacy of the existing institutional framework for the conduct of R&D. There are not enough organizations with the interest and capacity to work on developmental, experimental, and problem-solving activities, either in independent or in education-agency settings. There are too few sites where critically sized, interdisciplinary teams can be formed to work on complex educational problems. The institutional development program of the NIE should include activities intended to identify and overcome such deficiencies. Among its activities might be:

1. *Institutional requirements.* The group concerned with manpower requirements should also consider the availability of and need for appropriate institutional settings and should recommend programs intended to overcome deficiencies.

2. *Institutional development.* After appropriate study, the NIE might identify the need for certain new institutions. Its role might then be to catalyze their formation through planning and start-up support. The major portion of continuing support, however, should be intended to come through other NIE programs. Among the kinds of institutions that might be begun are:

- Large, interdisciplinary centers for the study of educational problems.
- Problem-solving organizations to serve the needs of consortia of state or local educational agencies.
- Centers that develop and maintain large data bases of widespread value to educational research. These might be data on groups of students or on institutions followed over many years or they might be large survey files.
- Production organizations for high-quality television or computer-based instructional materials (on the model of Children's Television Workshop, the producers of *Sesame Street*).

- o Demonstration schools and associated teacher centers to bring new educational practice to local schools through close association with local teachers and administrators.
- o Additional R&D Centers and Regional Laboratories. There still exists the need for university-based, interdisciplinary research centers and for institutions emphasizing educational development.

3. *Institutional support.* Some existing R&D institutions might require and warrant support beyond that available to them from other specialized NIE programs. It may prove desirable to enable those institutions that have demonstrated competence and productivity to develop new ideas, refine old ones, and fill in the gaps in their programs through provision of institutional support, on the model of programs of other Federal agencies, especially the NIH.

PROGRAM ELEMENT IV-3: STRENGTHENING THE LINKAGE BETWEEN R&D AND PRACTICE

Types of Activity

Clearly one of the most serious problems of the educational R&D system is its failure to establish close and continuing linkages between the R&D system and the educational agencies. A number of attempts of various kinds have been made in the past. Much greater effort will have to be made in the future.

There appears to be no single, simple action that will solve this problem. It is a systemic one and will only yield to a wide variety of actions at many places in the system. Many of them have been included in other program elements throughout this program description. Among them are:

- The concept of problem-focused program elements, whose very goal is the linkage between R&D and practice.
- The involvement of members of the operating education community in advisory committees and task forces, and their service as temporary NIE staff members.
- The activities intended to place R&D-trained personnel in problem-solving positions in state and local agencies.
- The training program for state and local personnel.

But there may be some activities that should be undertaken solely with the intention of strengthening the linkage between R&D and practice. Among the possibilities are:

1. *Support for state and local R&D.* An experimental program might be undertaken in which the NIE (and OE) provide support (perhaps on a matching basis) to state and local agencies to enable them to conduct or contract for R&D in support of their own perceived needs.

2. *State and local R&D needs.* The NIE could undertake or support a study of the needs for R&D at the state and local level, both as they are perceived by practitioners and as those familiar with R&D see them. A similar study might be undertaken for colleges and universities.

3. *State and local R&D activities*. A study might be done of the extent to which R&D has been and currently is being used in educational agencies.

4. *Comparative analyses*. Two categories of experience in the use of R&D should be examined for relevant lessons. They are:

- o The experience of other sectors of the economy--agriculture, health, industry, space, and defense.
- o The experience of other countries--Great Britain, Sweden, Japan, the Soviet Union, Canada--with educational R&D.

5. *Mechanisms for implementation*. Careful studies must be undertaken of the impediments to innovation within the education system. At the same time, experiments with a variety of mechanisms for facilitating implementation should be undertaken. These would include:

- o Far greater involvement of the teacher in educational R&D activities. The British experience with local Teacher Centers for curriculum and examination development should be used as one guide in the development of American models.
- o Use of the organized teaching profession as a means of disseminating and encouraging innovation.
- o Local and regional demonstration schools in which innovative practices are used. These schools would accept teacher visitors, for short or long stays, to acquaint them with the new practices. The schools would have special innovation staffs who would visit schools in the region helping to introduce the new practices and who would conduct courses and seminars.

PROGRAM ELEMENT IV-4: DEVELOPING STRUCTURES FOR INFORMATION TRANSFER

Types of Activity

Effective R&D depends on effective information transfer within the R&D system. New findings must flow freely and directly among those who are pushing forward the frontiers of knowledge or developing ways to put that knowledge into practice. (The flow of information between R&D and practice was discussed in the previous program element.) The established scientific disciplines have evolved and are continuing to evolve effective formal and informal networks for information flow. Professional societies, scientific journals, books, scientific conferences, and "invisible colleges" are the principal mechanisms for exchange. The newer disciplines and areas of concern and, especially, the applied sciences and technologies are less well-served. Serious deficiencies in information flow exist in the field of education. Some deficiencies have to do with the quality of the information transferred; the noise drowns out the clear signals. Some deficiencies have to do with the absence of certain branches in the network; researchers in different disciplines do not communicate, even when concerned with the same problem. Some deficiencies have to do with the access to existing information; many reports never enter the accessible literature. A number of efforts are under way to alleviate these problems. The NIE should, in cooperation with OE's National Center for Educational Communication (NCEC) and the NSF, undertake additional efforts to facilitate the flow of useful information within the educational R&D system. Among its activities might be:

1. *Professional societies.* The NIE might provide assistance to professional societies in the development and support of journals, conferences, and other means of information exchange, especially those means that strengthen scientific review procedures within the societies.

2. *Information systems.* Reference systems should be continually refined and improved. More attention might be paid, for example, to gathering and providing data on investigators, institutions, and projects.

PROGRAM ALTERNATIVES

In developing an example program for the NIE, a number of alternative program structures were considered and rejected. The principal ones were:

- o *Educational Problems*. All R&D activities would be undertaken as part of comprehensive programs addressing urgent educational problems.
- o *Educational Levels*. The program would be divided first according to levels of education: preschool, primary, secondary, higher, vocational, continuing.
- o *R&D Activity Types*. The first program division would be into the several types of R&D activity: research, development, experimentation, evaluation.

The advantages and disadvantages of each are described below.

Educational Problems

The NIE will be distinguished by its central concern with R&D as a means of achieving educational improvement and reform. To a greater extent than most previous Federal educational R&D programs, it will focus its attention on the solution of major educational problems. This study has suggested that about 50 percent of its program, that contained in Program Area I, be devoted to such activities. Some, however, have argued that virtually all of the program should be so directed. The *advantages* they see are:

- o Concentration of educational R&D's limited resources on the vital issues facing the education system.
- o Strengthened ability to convey to executive and legislative authorities, to the education system, and to the public the relevance and importance of educational R&D to educational needs.
- o A considerable amount of basic research (rather than strictly problem-oriented work) could be carried out as part of a full-scale attack on problems of flexible definition and broad scope.

However, the *disadvantages* include:

- o The prospect that short-term, problem-oriented activities would, in practice, drive out longer-term, knowledge-building activities, to the eventual detriment of the ability of education to develop better problem solutions.
- o The likelihood that the sum of the activities devoted to improving educational practice, strengthening its foundations, or building the R&D system undertaken as part of problem-oriented programs would not constitute adequate national programs in those areas.
- o The danger that an entirely problem-oriented program would raise the expectations of achievement too high and would not convey honestly to the various constituencies the need to build the tools, foundations, and R&D system of education if real improvement is to be achieved.

As the NIE matures, the balance of resources going into problem-oriented activities may shift. However, it seems advisable in the early years explicitly to include other kinds of activities, such as those in Program Areas II, III, and IV, in the program so that the balance may be explicitly determined on the basis of experience.

Educational Levels

Educational studies are conventionally divided according to levels: elementary and secondary education is the concern of one set of organizations and R&D personnel; higher education is the subject of another; preschool education, still another; and so on. Convention would suggest, therefore, that the NIE's program also be divided according to those educational levels.

The *advantages* of such a program structure would be:

- o Correspondence with the organization and administration of formal education, with the structure of many professional societies and education interest groups, and with the organization of concerned Federal agencies, such as the OE and NSF.

- o Improved capacity to recognize differences in educational problems and practices at different levels of education.

The *disadvantages*, however, would be:

- o Perpetuation of distinctions and barriers that in many cases are unnecessary or inappropriate.
- o An implicit focus on existing formal systems of education would be imposed.

No doubt the NIE will want to address problems and practices that are specially relevant to one or another level of education, but it can do so within the program structure that has been suggested, when and as such a view is appropriate. It need not view all problems within such a framework, however, as it would have to were an educational-level structure to be adopted.

R&D Activity Types

The several types of activities that R&D comprises each have special requirements in terms of specification, staffing, and management. Basic research activities, for example, are generally best specified by the scientist who is to perform them, without detailed guidance from the funding agency. Large-scale development activities, however, may be better specified by groups that represent the eventual user as well as the developer, and carried out by developers who accept closer scrutiny by the funding agency. This suggests that an R&D program might usefully be divided according to the types of R&D activity.

The *advantages* of such a program structure are:

- o Its correspondence with the organization and administration of much educational R&D.
- o The ease with which each type of R&D could be specified, staffed, and managed in ways that are appropriate for it.

The *disadvantages* of organizing the program in this way include:

- o The difficulty of organizing and managing a comprehensive program including several types of R&D activity addressing a major educational problem.

- o The introduction of unnecessary and inappropriate barriers between the several stages of R&D.
- o The reduced ability to explain to administrative, legislative, and other constituencies the importance and relevance of the R&D program to educational needs.

The program structure proposed in this study does recognize the need to specify and manage the several types of R&D differently. This is explained in further detail in the next chapter. But it seems neither necessary nor desirable to let that recognition become the organizing principle for a program of studies whose primary objective is to improve education.

IV. ORGANIZATION

The design of institutions is an art, not a science. This is especially true for R&D institutions. The art is an important one, however, for an institution's structure can facilitate creativity or impose docility; it can encourage continuous self-renewal or induce unresponsive rigidity; it can make communication and coordination easy or introduce unnecessary barriers. Program may be primary, but organization is what determines how well the program will be carried out.

Institutional design need not be entirely intuitive. There is, for example, a considerable amount of experience with R&D organizations that is relevant to the design of the NIE. And some study has been made of the principles of R&D management and organization design outside and within the Federal government. Finally, many individuals have had long experience with R&D management, educational R&D, and the combination of the two. Their intuition and judgment are valuable. The organization for the NIE described in this chapter has drawn heavily on those sources. It is specifically designed to implement the program discussed in the previous chapter.

This proposed organization, however, *is only an example of what the NIE might become.* Like the other specifics of the Institute, the organization should be defined finally by the Director, his staff, and the advisory panels. Moreover, it should remain flexible enough to adapt to changing circumstances and opportunities. This proposed structure, thus, serves to explain, in detail, one way in which the NIE might carry out its program.

OVERALL ORGANIZATIONAL STRUCTURE

The major proposed structural features of the NIE are displayed in Figs. 1 and 2. In Fig. 1, the NIE's location within the Department of Health, Education and Welfare is shown; Fig. 2 indicates the NIE's major internal substructures.

In summary, the NIE would be

- *A separate agency* within HEW,

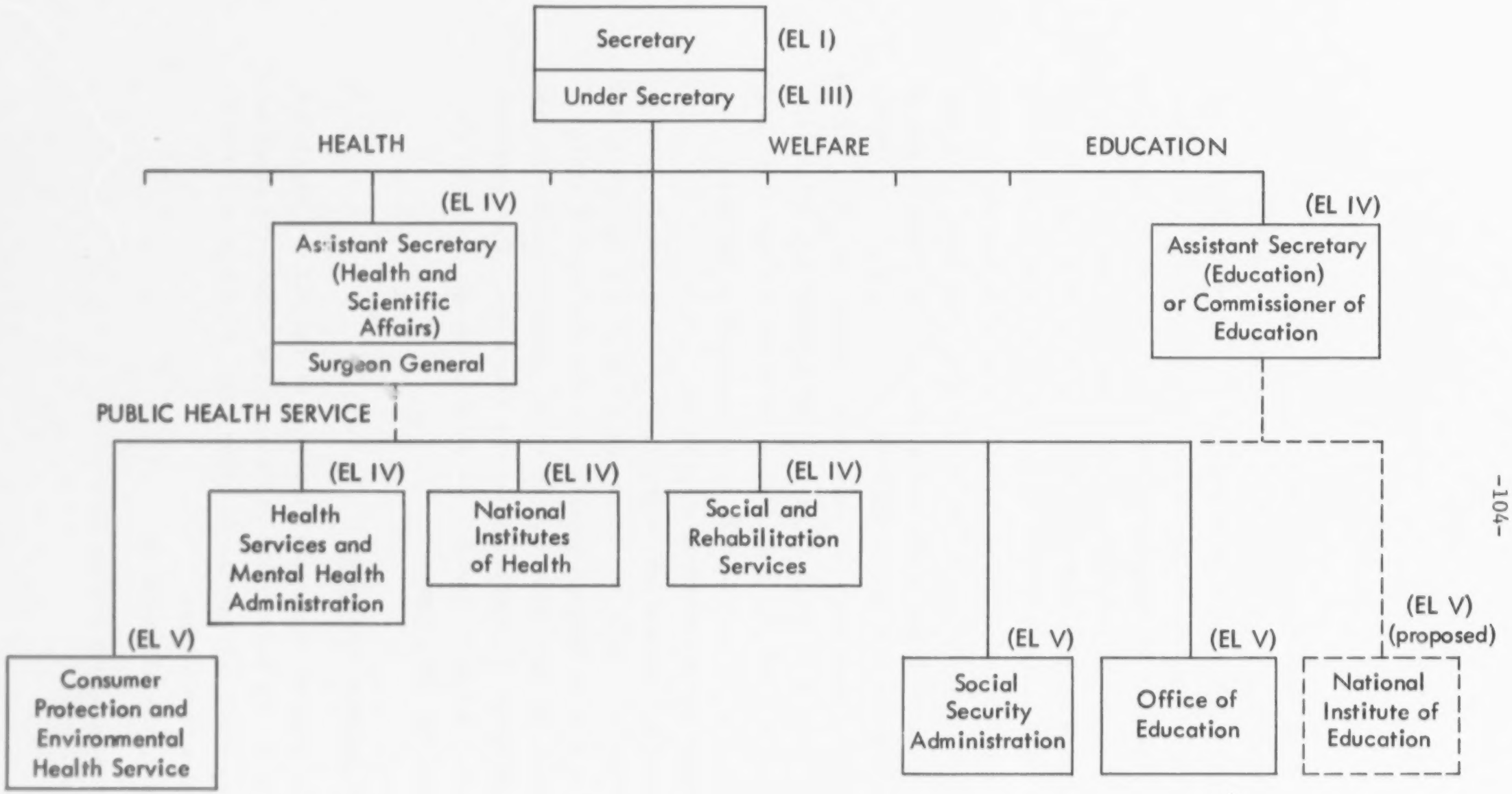

Fig.1—Location of National Institute of Education Within the Department of Health, Education and Welfare

(The Executive Level of the director of each agency is indicated alongside the corresponding box; the range of executive grades is from EL I to EL V, EL V being the lowest)

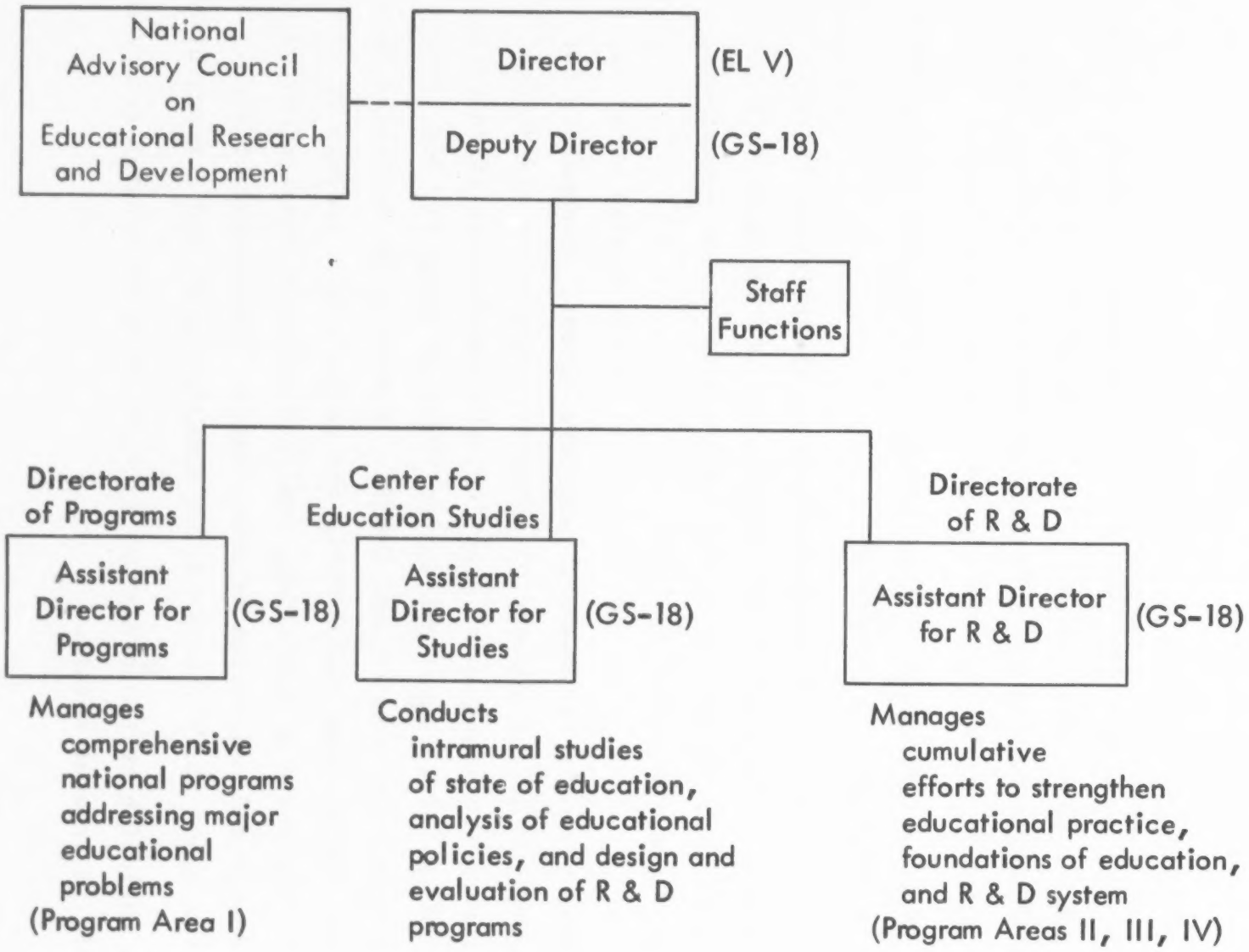
National Advisory Council on Educational Research and Development
Director
(EL V)
Deputy Director
(GS-18)
Staff Functions
Directorate of Programs
Assistant Director for Programs
(GS-18)
Manages comprehensive national programs addressing major educational problems
(Program Area I)
Center for Education Studies
Assistant Director for Studies
(GS-18)
Conducts intramural studies of state of education, analysis of educational policies, and design and evaluation of R & D programs
Directorate of R & D
Assistant Director for R & D
(GS-18)
Manages cumulative efforts to strengthen educational practice, foundations of education, and R & D system
(Program Areas II, III, IV)

Fig.2—Major components of the National Institute of Education

- o *Parallel* to the OE,
- o *Reporting to the Secretary of HEW* through his designee, and
- o Led by a *Director* at Executive Level V, like the Commissioner of Education at present.

Its administration would be provided by

- o The *National Advisory Council on Educational Research and Development*, which would assist in setting general policy, and
- o The *Director*, who would be responsible for continuous administration of the Institute's policies and programs.

The internal structure of the Institute corresponds to the structure of its programs. It comprises

- o A *Directorate of Programs*, headed by an Assistant Director for Programs, responsible for development and management of comprehensive national programs that address major educational problems (Program Area I);
- o A *Directorate of Research and Development*, headed by an Assistant Director for Research and Development, responsible for development and support of coherent, cumulative efforts to strengthen educational practice, the foundations of education, and the educational R&D system (Program Areas II, III, IV);
- o A *Center for Educational Studies*, headed by an Assistant Director for Studies, responsible for conduct of a program of studies of the state of education, analyses of educational problems, and design and evaluation of R&D programs (Intramural Studies); and
- o The usual *staff functions* for administration and communication.

The following sections discuss each of these structural features of the NIE in greater detail.

POSITION WITHIN HEW

As Fig. 1 shows, establishing the NIE as a separate agency within HEW with an Executive Level V Director would raise it to a position parallel to the other HEW operational agencies: the *welfare* agencies (Social Security Administration, Social and Rehabilitation Service),

health agencies (Health Services and Mental Health Administration, NIH, and Consumer Protection and Environmental Health Service), and one other *education* agency (the OE).

There are three reasons for recommending this position within HEW:

1. To provide the NIE with the *stature within the Federal government* that will enable it to "link the educational research and experimentation of other Federal agencies...to the attainment of particular national goals" and to provide strong leadership for the nation's program of educational R&D.
2. To enable the NIE to establish a *personnel and salary system* that will be adequate to attract and retain the necessary managerial and professional personnel.
3. To demonstrate the *nation's commitment* to a strong and effective program of educational R&D.

Stature Within Government

At present the stature of the OE's R&D arm within the Federal government is low in relation to that of comparable agencies. That arm, the NCERD, is authorized to have a GS-17 Director. He reports to the GS-18 Deputy Commissioner for Development, who reports to the Level V Commissioner of Education, who reports to the Secretary of HEW. In contrast, the directors of the R&D arms of the other agencies in the Federal government having a concern with education hold GS-18 or Executive Level positions, as is shown in Table 5. The Assistant Director for Education of the NSF, for example, holds a Level V position. The Assistant Director for Planning, Research, and Evaluation of the Office of Economic Opportunity now holds a Level IV position. Both of these men report directly to the heads of their agencies. Both are also managing vigorous and effective programs of educational development and experimentation.

Table 6 indicates the status of R&D in the other nonspace, nondefense Federal departments having R&D programs. In each case, the Director is Level V or above.

Table 5

STATUS OF RESEARCH AND DEVELOPMENT IN OTHER FEDERAL AGENCIES CONCERNED WITH EDUCATION

Agency	Level
National Science Foundation	
Director	EL II
Assistant Director for Education	EL V
Office of Economic Opportunity	
Assistant Director, Planning R&E	EL IV
Director, Research and Evaluation	EL V
National Institutes of Health, HEW	
Director	EL IV
Director, National Institute of Child Health and Human Development	GS-18
Office of Child Development, HEW	
Director	GS-18
National Foundation on Arts and Humanities	
Chairman	EL III
Department of Labor	
Assistant Secretary for Policy Evaluation and Research	EL IV
Assistant Secretary for Manpower	EL IV

Table 6

STATUS OF RESEARCH AND DEVELOPMENT IN OTHER DEPARTMENTS

Agency	Level
Department of Transportation	
Assistant Secretary for Research and Technology	EL IV
Department of Commerce	
Assistant Secretary for Science and Technology	EL IV
Director, National Bureau of Standards	EL V
Department of Agriculture	
Director, Science and Education	EL V
Administrator, Agricultural Research Service	EL V

If the NIE is to provide strong and effective leadership to the national program of educational R&D, it and its Director should be able to speak at least as equals to the other concerned agencies in the councils of government. This means that the Director should be no lower than Executive Level V.

Personnel and Salary System

As Table 7 indicates, the current supergrade management structure for educational R&D in the Office of Education has very few high-level positions in comparison with those of the NSF and the NIH. This relative deficiency remains even when the numbers are corrected for budget size. The NSF has 5 times the budget of the NCERD and 13 times the number of supergrade management personnel; the NIH has 17 times the budget and 28 times the personnel. If all supergrade personnel are included, not just those in management positions, the comparison is even more stark: the NSF has 36 times as many supergrades; the NIH has 58 times as many.

Table 7

SUPERGRADE MANAGEMENT PERSONNEL
OF NCERD, NSF, AND NIH

Level	OE-NCERD	NSF	NIH
EL II	..	1[a]	..
EL III	..	1	..
EL IV	..	..	1[a]
EL V	..	5	..
GS-18	..	11	48
GS-17	1[a]	32	26
GS-16	2	..	10

[a]Director.

These differences lead to important differences in the ability of the three agencies to attract and retain high-quality management and professional personnel. The NCERD is at a disadvantage not only in competing for personnel with industry, university, and nonprofit

agencies, but also in competing for high-quality personnel with *other government R&D agencies concerned with education and related fields*. If the NIE is to develop and implement a strong program of educational R&D, it must be able to recruit and retain absolutely first-class staff. To do so, it will need a personnel structure that includes many more supergrades, GS-16 through GS-18, or equivalents, than NCERD has had. The same reasoning leads again to the desirability of a Director at Executive Level V or above.

National Commitment

The final reason for recommending that the NIE be a separate agency is the symbolic importance of that stature both within government and outside of it. This is at once the least concrete and the most important of the reasons for establishing a separate national agency for educational R&D.

Creation of the NIE would symbolize to the education and the R&D communities the importance that the Federal government and the nation ascribe to educational improvement and reform through R&D. It would be a clear statement that concentrated application to education of the wisdom and talents of the nation's most highly qualified scientists and innovators is needed and desired. It would raise the creation of new knowledge about education to the stature now accorded to studies of health, symbolized by the NIH. It would increase the visibility of the educational R&D system and, thereby, the ability to attract new personnel to the field and to gain the attention of educators.

Possible Problems

Separating the agency having responsibility for management and support of the national educational R&D program from the OE may also introduce some problems. The most evident one is the possible introduction of new bureaucratic impediments to coordination with the OE. This could be a real cost. However, despite the lack of such barriers, the current situation, until recently, has not been one of close coordination between NCERD and the other OE bureaus. Achievement of such

coordination depends more on positive actions to introduce joint planning, transfer of information, and shared program responsibility than it does on joint residence within the same organizational box. *But to insure that such positive actions are taken, both the OE and the NIE should report to the same official designated by the Secretary.* In the initial proposal this was intended to be the Assistant Secretary for Education. An alternative, preferable in many regards, would be to delegate the authority to the Commissioner of Education, perhaps at the same time appointing or raising him to a Level IV position.

Alternatives

Since there have been a number of other recent proposals for reorganizing the Federal education agencies, it may be useful to review some of the alternatives to the proposed position of the NIE within HEW and to identify their differences and similarities.

Figure 3 is a schematic diagram of the underlying structure of the Federal education agencies, independent of the names of the various agencies and the titles and levels of their directors. One subagency is the manager of Federally sponsored (or conducted) educational R&D programs. The other subagency manages Federal programs of educational assistance--the various categorical and general-aid programs. Both report to a principal Federal education officer, who reports to the Secretary of HEW, and who heads the Federal education agency.

All the major proposals for reorganizing the Federal education agencies conform to this general scheme (with the possible exception of the proposed Department of Education, whose Secretary might not report to the Secretary of HEW). The differences lie not in whether or not a separate agency is charged with responsibility for R&D, but in the names of the various agencies and the titles and levels of their Directors, and in the differences in stature and adherence to tradition that they represent.

The major proposals are summarized in Table 8 as a listing of agency names, position titles, and position levels. The current situation appears first in the table, for comparison. Currently, the overall Federal education agency is called the Office of Education and is

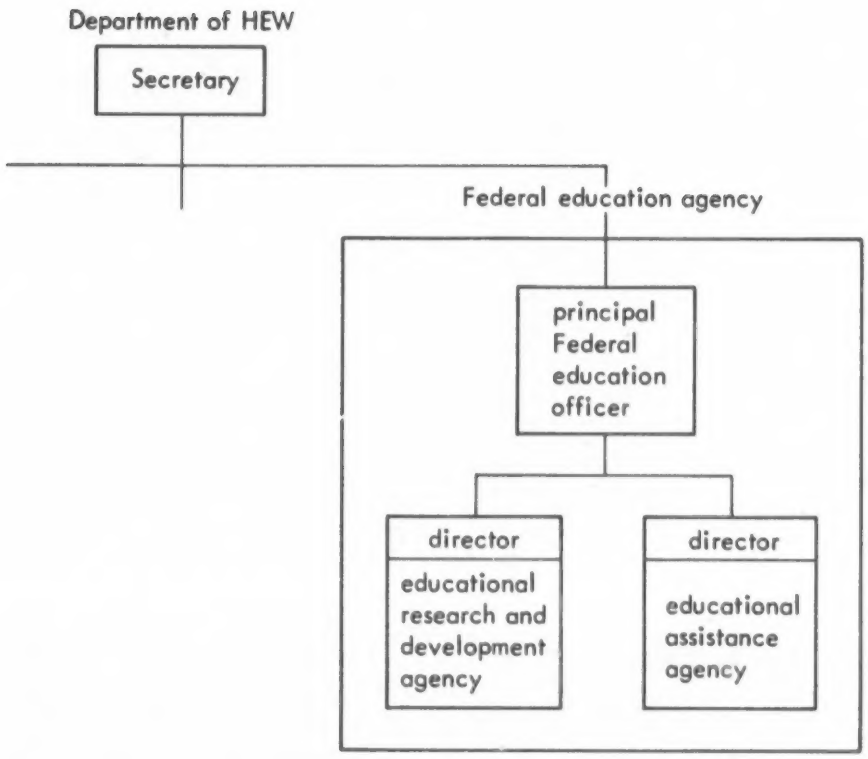

Fig.3—Schematic diagram of education agencies within HEW

Table 8

THE PLACE OF R&D WITHIN ALTERNATIVE FEDERAL EDUCATIONAL ORGANIZATIONS

Alternative	Federal Education Agency	Principal Federal Education Officer/Level	Educational R&D Agency	Director, Educational R&D Agency	Educational Assistance Agency	Director, Educational Assistance Agency
Current	Office of Education	Commissioner, EL V	NCERD	Director, GS-17	Bureaus of OE	Deputy Commissioners, GS-18
1	...	Commissioner, EL IV	NIE	Director, EL V	Office of Education	Director, EL V
2	...	Commissioner, EL III	NIE	Director, EL IV	Office of Education	Director, EL IV
3	Office of Education	Commissioner, EL IV	NIE	Director, EL V	Educational Assistance Administration	Director, EL V
4	Office of Education	Commissioner, EL III	NIE	Director, EL IV	Educational Assistance Administration	Director, EL IV
5	...	Undersecretary, EL III	NIE	Director, EL IV	Office of Education	Commissioner, EL IV
6	Department of Education	Secretary, EL I	NIE	Director, EL IV	Educational Assistance Administration	Director, EL IV

headed by the Commissioner of Education, presently at EL V. The R&D subagency is NCERD, headed by a GS-17 Director. The assistance subagency comprises the major Bureaus of OE, grouped into units headed by Deputy Commissioners. The arrangement suggested in this report is shown as Alternative 1. The assistance subagency retains the name Office of Education but has a separate Director (at EL V) who reports to the Commissioner (raised to EL IV). Another possibility would be for the Commissioner to retain direct responsibility for OE. Some reviewers of the draft of this report have suggested that the evidence supports the suggestion shown in Alternative 2: an NIE Director at EL IV reporting through a Commissioner raised to EL III. In neither of these alternatives does the combination of the two subagencies receive an agency name. Alternative 3 is the same as Alternative 1 except that the combination of the two subagencies is called the Office of Education and the educational assistance subagency receives a new name, for example--Educational Assistance Administration. Alternative 4 modifies Alternative 2 in the same way. Another current proposal affecting the Federal education agencies is that HEW have three undersecretaries, one for each of its major areas of concern. With such an arrangement, Alternative 5 appears feasible: no separate name for the combined education components of HEW; the educational assistance subagency retains the Office of Education name; the principal Federal education officer is the Undersecretary for Education. Finally, several individuals and groups have been urging creation of a separate Department of Education. In one yariant it would be a subcabinet department within HEW like the Army, Navy, and Air Force within DoD; in the other variant it would be a cabinet-level department. In either case, Alternative 6 would be a feasible arrangement: the NIE and Educational Assistance Administration (each headed by EL IV Directors) both report to the Secretary of Education.

As these alternatives reveal, the location of NIE within HEW and its association with whatever agency is called the Office of Education will not necessarily be resolved solely on the basis of planning for the NIE. Other possible changes within HEW may affect the outcome. But it is also important to remember that many of the differences among

the alternatives are matters of names, titles, and levels. The administrative qualities of the NIE that are essential for its success should be achievable under any one of the alternatives. The essential qualities are: a director of at least EL V and adequate numbers of supergrade positions, a flexible personnel authority suited to the needs of hiring first-class R&D personnel, the authority to conduct intramural research, financial authority and administrative arrangements suited to the special needs of managing R&D, insulation from the pressures and shifting priorities associated with large educational assistance programs, and a separate identity and visibility.

NATIONAL ADVISORY COUNCIL ON EDUCATIONAL R&D

Advisory councils may be figureheads or helmsmen, public fronts or private backers. The choice is made in part by how they are constituted, in part by how they are used. In the case of educational R&D, it appears important to establish an Advisory Council that can exert real influence over policy and priorities. There are two reasons:

1. The history of educational R&D has been one of rapidly fluctuating policies and priorities. Perhaps no complaint is heard more frequently from those who have worked in educational R&D than that the programs and preferences of Federal support for educational R&D change continuously as personnel, political pressures, and administrations come and go. The stability and continuity of effort essential to cumulative, coordinated R&D programs is difficult to achieve under such circumstances. A distinguished National Advisory Council could play a large role in establishing and maintaining appropriate R&D policies and priorities.

2. Many forces and interests have a legitimate concern with educational R&D and will wish to insure that their points of view receive adequate representation in the NIE's Councils. Its many advisory and scientific panels will serve these needs in part. But to insure that the compound of those concerns is not simply a miscellany of projects, there needs to be a final group that can set priorities and make choices. The director would, of course, exert a major influence. But the deliberations of a representative National Advisory Council would give such

hard choices a legitimacy and authority that no individual's choices could achieve.

In order to exercise these responsibilities the Council should be constituted as follows (items with an asterisk are included in the pending NIE legislation):

Responsibilities

* 1. To advise the Director of the Institute and the Secretary of HEW in the establishment of general policy for the Institute and *in the development of its program.* (The last provision is not included in the pending NIE bill.)
* 2. To review the status of educational R&D in the United States and advise the Director and the Secretary on ways of improving the education R&D effort.
* 3. To present an annual report on the current status and needs of educational R&D to the Secretary, for transmittal to the President.
4. To make recommendations to the President with respect to appointment of the Director of the NIE.

Membership

1. Members of the Council should be appointed by the President for staggered *six-year terms*, one-third of the terms expiring every two years. (One-third of the first Council would serve for two years; one-third for four years; one-third for six years.) With the exception of the first members, members should serve no more than one term. Vacancies should be filled for the remainder of the term of the predecessor.
2. There should be *twenty-four* appointed members of the Council. In addition, the NIE Director should serve on the Council, ex officio.
3. Members of the Council should be chosen on the basis of achievement and service in the fields of R&D, education, or public affairs. They should be so selected as to provide wide representation of the views of educators, the R&D community, and the public.

Staff and Studies

* 1. The Council should employ a staff of *no more than five professionals* to assist in carrying out its responsibilities. (The staff limitation is not in the pending NIE bill; it is similar to a provision governing the staff of the National Science Board.)

2. The staff should be directed by an *Executive Secretary*, responsible for developing issues for consideration by the Council.

* 3. The Council should be able to enter into contracts for studies necessary to the discharge of its duties.

The recommendations with regard to the Council's *responsibilities* follow very closely the provisions in the pending NIE bill. However, two responsibilities have been added here. The first is to advise on the development of the program. The reasoning behind this addition has been noted above. The second is to make recommendations with respect to appointment of the Director. The choice of Director is so crucial to the success and credibility of the Institute that it appears desirable that his choice be informed by the deliberations of the Council, as representatives of education, the R&D community, and the public.

The recommendations with regard to the Council's *membership* are modeled on membership provisions for the National Science Board, which has successfully guided the growth of the NSF. The emphasis is on the need to achieve *stability*, *legitimacy*, and *representativeness*. The provisions of the pending bill, calling for fifteen members for three-year terms, seemed to encourage too high a rate of turnover and to provide for too few members to achieve adequate representation of the many points of view in education. The statement of qualifications is intended to emphasize the need for legitimacy in the eyes of the many concerned communities.

The recommendations with regard to *staff and studies* are intended to give the Council the tools to be an active participant in policy setting. Frequently, advisory councils are left dependent for the necessary work on the agencies they must advise.

DIRECTOR/DEPUTY DIRECTOR

The selection of a Director will undoubtedly be the most crucial decision to be made during the creation of the NIE, for he will have to select the major staff members, establish major program directions in conjunction with the National Advisory Council, and convey the nature and content of the Institute's activities to its several constituencies. To assist him in these activities, he will need a Deputy Director whose strengths complement his own.

To provide the necessary leadership, the Director should have the following responsibilities and conditions of appointment:

Responsibilities

1. To establish general policy and set program priorities, in conjunction with the National Advisory Council.
2. To select and appoint the principal staff members and officials, including the Deputy and Assistant Directors.
3. To determine the allocation of the Institute's budget to its several programs after consultation with the National Advisory Council and the Deputy and Assistant Directors.
4. To review and approve major Institute programs and to assume responsibility for their quality.
5. To organize and structure the Institute so that it can best execute its responsibilities.
6. To report on the Institute's program and operation to the Secretary of HEW, and, through him, to the President; to the Congress; and to the education and R&D communities and the public.

Conditions of Appointment

* 1. The Director should have a rank of Executive Level V in the Federal Executive Schedule.

* 2. He should be appointed by the President and confirmed by the Senate, to a *renewable term of six years*, unless removed by the President. (The six-year term is not provided in the pending bill.)

3. A slate of qualified nominees for the directorship should be presented to the President by the National Advisory Council before the appointment is to be made.
4. The Director should report to the Secretary of HEW through the Secretary's designee.
5. The Director should serve as a member of the National Advisory Council.

The statement of *responsibilities* makes it clear that the Director has authority for the Institute's general policy, priorities, staff, budget, program, organization, and representation before constituencies.

The *conditions of appointment* reflect the recommendation, discussed earlier, that the Director have a rank appropriate to his responsibilities and authority. A term of six years is set so that the Director's performance might be reviewed regularly, but at an interval long enough to encourage stability and insulation from short-term political pressures. The other recommendations have been discussed earlier.

The Deputy Director should have the following responsibilities and conditions of appointment:

Responsibilities

1. To carry out such duties as the Director, with the approval of the National Advisory Council, may prescribe.
2. To act as Director of the Institute if the Director is absent or disabled, or if there is a vacancy in the office of Director.

Conditions of Appointment

1. The Deputy Director should have a rank of GS-18 or equivalent.
2. He should be appointed by the Director.

These responsibilities and conditions of appointment are conventional.

DIRECTORATE OF PROGRAMS

The work of the Institute must be accomplished through its three constituent organizations: the Directorate of Programs, the Directorate of Research and Development, and the Center for Education studies.

The cutting edge of the Institute's program, and the characteristic that distinguishes it from prior educational R&D efforts, is its development and management of comprehensive programs directed toward the solution of major educational problems. The responsibility for these activities, which should employ around 50 percent of the Institute's resources (between $50 million and $70 million initially), would be with the Directorate of Programs; its organization is shown in Fig. 4.

To carry out its responsibilities, the Directorate would have the following functions and staff structure:

Functions

1. To identify systematically and describe major educational problems and opportunities in conjunction with the Center for Education Studies.
2. To organize and manage comprehensive national programs of research, development, experimentation, evaluation, and innovation directed toward the solution of major educational problems.

Staff and Structure

1. The Directorate of Programs would be headed by an *Assistant Director for Programs*, who would hold a rank of at least GS-18 or equivalent and be appointed by the Institute Director. He would be responsible for major staff assignments and budget allocations within the Directorate, and for the quality of his programs.
2. A *task force* would be formed for each major problem to be addressed by the Institute. Each task force would be headed by a *program manager*, who would hold a rank of at least GS-17 or equivalent and be appointed by the Assistant Director for Programs. He would be responsible for staff assignments and budget allocations within his task force, and for the quality of his programs.
3. Associated with each problem area and its task force would be a *program advisory group* comprising individuals from other government agencies, local and state agencies, the R&D community, and the public who have special concern with or

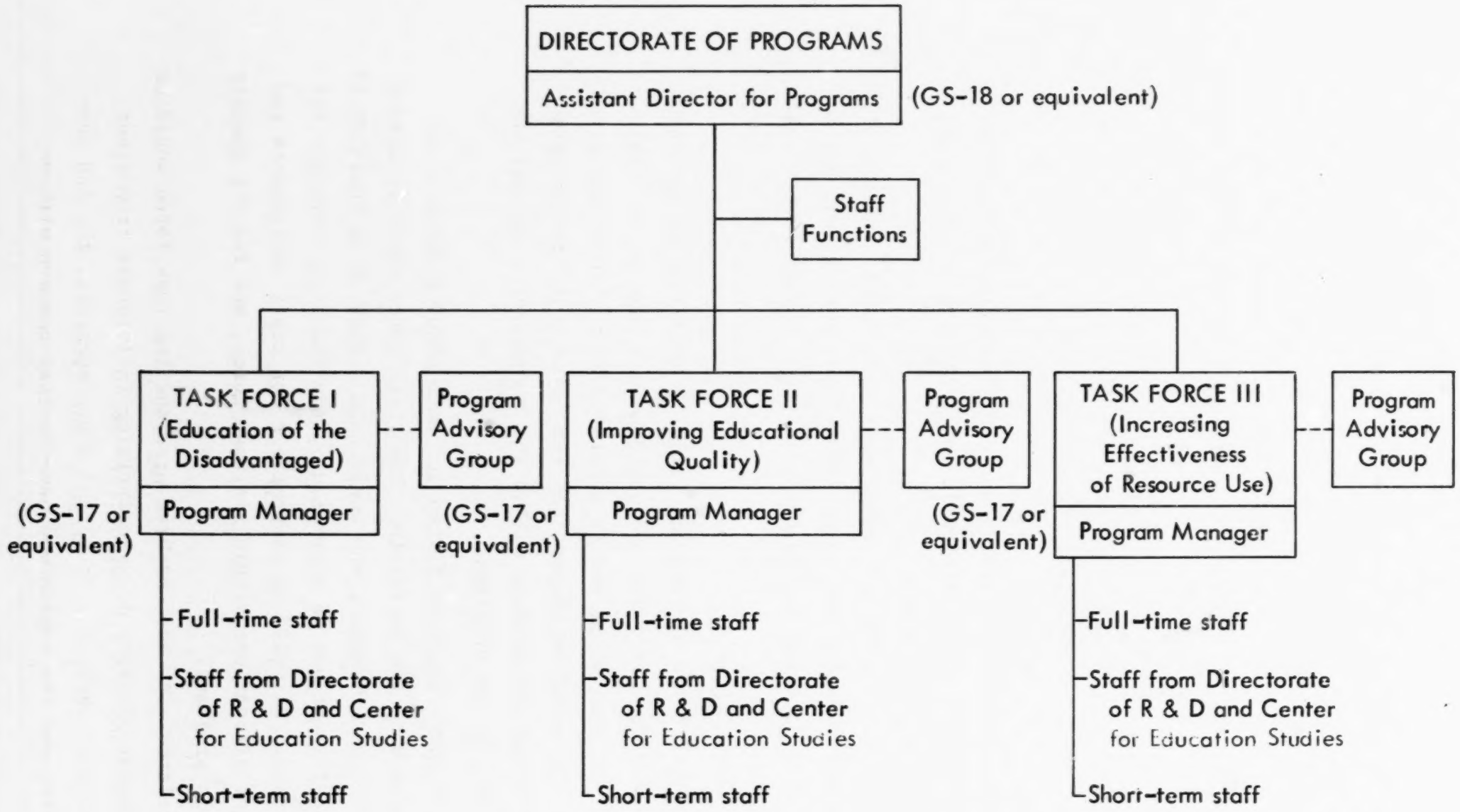
DIRECTORATE OF PROGRAMS
Assistant Director for Programs
(GS-18 or equivalent)
Staff Functions
TASK FORCE I (Education of the Disadvantaged)
Program Advisory Group
TASK FORCE II (Improving Educational Quality)
Program Advisory Group
TASK FORCE III (Increasing Effectiveness of Resource Use)
Program Advisory Group
(GS-17 or equivalent)
Program Manager
(GS-17 or equivalent)
Program Manager
(GS-17 or equivalent)
Program Manager
Full-time staff
Staff from Directorate of R & D and Center for Education Studies
Short-term staff
Full-time staff
Staff from Directorate of R & D and Center for Education Studies
Short-term staff
Full-time staff
Staff from Directorate of R & D and Center for Education Studies
Short-term staff

Fig.4—Internal Organization of Directorate of Programs.
(Task Force names are illustrative only)

knowledge about the problem area. The advisory group would advise the program manager and the Assistant Director of Programs on the design and conduct of the program and its association with practice.

4. *Members* of the problem task forces would be drawn from three sources:
   - o Full-time staff in the Directorate of Programs, who would form the core of the task force;
   - o Staff from the Directorate of Research and Development or Center for Education Studies seconded for part-time service; and
   - o Short-term staff in the Directorate of Programs, brought on to serve on a specific task force to which they bring special knowledge.

A problem task force would organize and manage each comprehensive national program. *The activities in the program, however, would be carried out primarily under contract by external R&D agencies: universities, state and local education agencies, Regional Educational Laboratories, nonprofit agencies, and profit-making firms.* Occasionally some activity might best be carried out at the Center for Education Studies. Occasionally, also, it might be sufficient to recommend to the Directorate of R&D that it include some activity or another among the activities it is supporting rather than undertake it specially as part of a task force's program.

The organization into problem-oriented task forces is recommended on two grounds. First, the task force is a *flexible organization.* It can be formed quickly, carry out its functions over a short or long period, and then be disbanded, its members going on to other assignments or back to their permanent organizational homes. It avoids institutionalizing today's problems as, for example, the establishment of problem-oriented institutes might do. Moreover, its size and staff composition can be matched to the problem's requirements. Task forces would remain in operation for periods of years.

Second, the task force is a means of facilitating *interaction and coordination* between work on the problems of education and work on

educational practice and foundations. By assigning program officers from the Directorate of Research and Development to serve on task forces, the task force gains ready access to knowledge of the state of the art in relevant areas and, reciprocally, the program officers gain an appreciation of the practical requirements for improvement in educational practices and foundations. This use of task forces is an adaptation to the management of extramural R&D programs of the *matrix organization*[1] that has been found to be a very effective structure for the management of intramural R&D programs in industry and nonprofit research organizations. (A similar structure has been employed by NASA in the management of some of its programs.)

The program advisory group associated with each task force is intended to assure that the task force develops a program of activities responsive to the needs and realities of the intended beneficiaries.

To indicate how the task forces might function, consider one on education of the disadvantaged. It might have the following characteristics:

TASK FORCE I. Education of the Disadvantaged

Program Manager--full-time staff member

Staff--Several full-time *staff members* of the Program Directorate;

Program officers from the Directorate of Research and Development concerned with evaluation, instructional process, teacher training, individual motivation, and group influences on motivation;

Fellows and other short-term appointees from universities and state and local education agencies; e.g., the Assistant Superintendent for Research from a large city, Dean of School of Teacher Education on leave, or a mathematician or scientist interested in education of the disadvantaged.

Program Advisory Group--*Government officials*, such as Associate Commissioner of OE for Elementary and Secondary Education, Director of Research and Evaluation at OEO. *Local and state education officials*, such as chief state school officers, superintendents, and school board members from urban

[1]Such an organization might have professionals assigned permanently to discipline-based departments, but they would work also as part of problem-based project teams comprising members of several departments. The individual's membership in both discipline "columns" and project "rows" is what has given rise to the term "matrix organization."

and rural districts. *Educators*, such as principals and teachers from schools in disadvantaged neighborhoods. *R&D personnel*, such as psychologists and sociologists, curriculum developers, and policy analysts who have worked on the needs of the disadvantaged. *Representatives of the affected communities*, such as parents and community leaders from ghetto neighborhoods.

Activities--(1) Development of a comprehensive, coordinated, but adaptive, multiyear plan of attack on the problems of the disadvantaged, including interrelated research, development, experimentation, evaluation, and innovation activities. (2) Contracting with appropriate agencies to carry out the components of the plan. (3) Monitoring progress in carrying out the plan and changing it as appropriate. (4) Coordinating plans and activities with other R&D and operating agencies.

The eventual responsibility for assuring that the work of the task forces is competent and effective lies with the Assistant Director for Programs and the Director of the Institute.

DIRECTORATE OF RESEARCH AND DEVELOPMENT

The solid basis for the Institute's problem-solving activities is established by its programs intended to improve educational practice, strengthen education's foundations, and build a strong R&D system. The responsibility for the initiation and support of these activities, which should employ almost 50 percent of the Institute's resources (between $50 million and $70 million initially), would lie with the Directorate of Research and Development; its organization is shown in Fig. 5.

To carry out its responsibilities, the Directorate would have the following functions and staff structure:

Functions

1. To organize and manage coherent, cumulative programs intended to improve educational practice.
2. To organize and manage coherent, cumulative programs intended to strengthen education's scientific and technological foundations.
3. To identify the need for improvements in the educational R&D system and undertake programs intended to accomplish them.

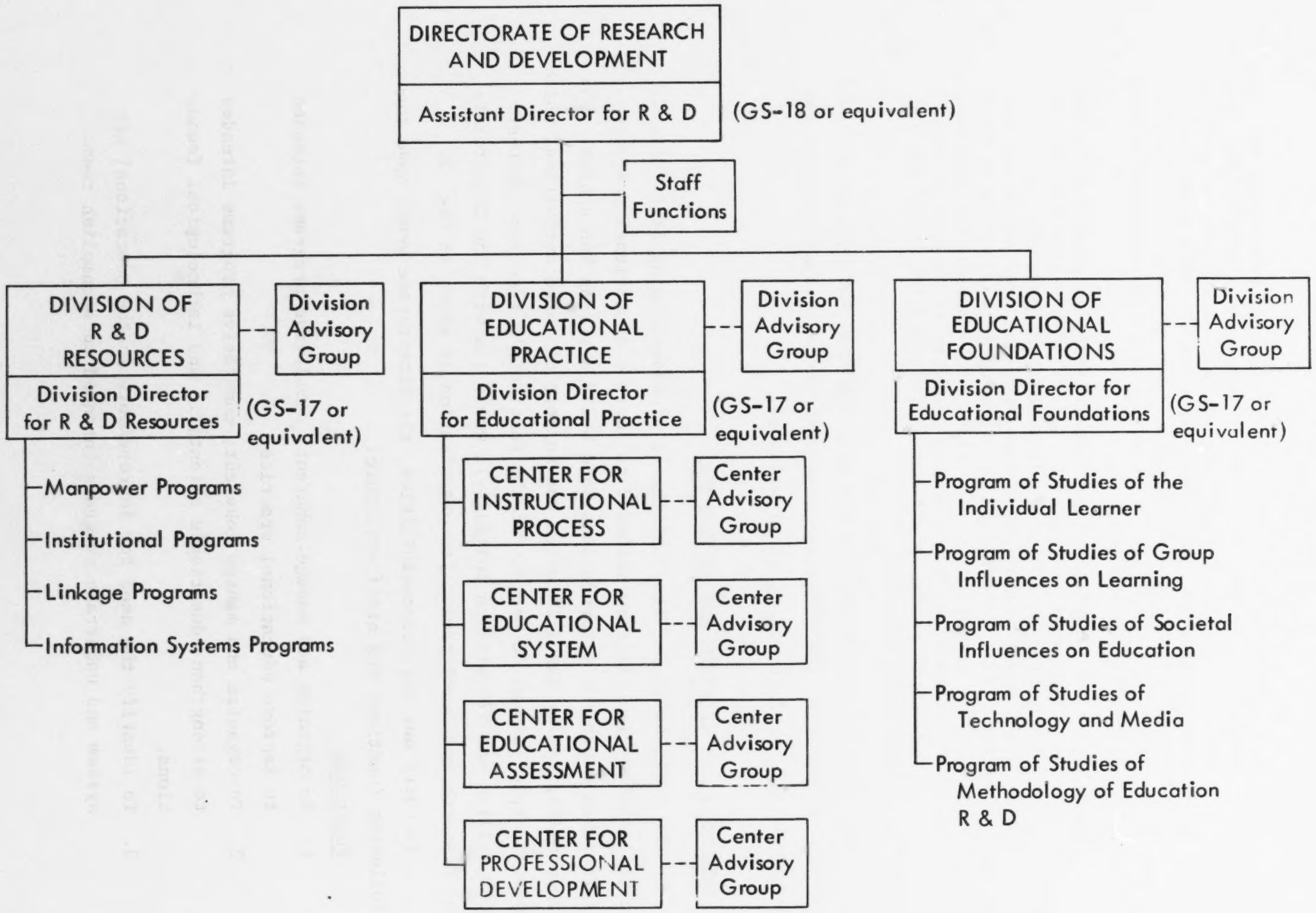
DIRECTORATE OF RESEARCH AND DEVELOPMENT
Assistant Director for R & D
(GS-18 or equivalent)
Staff Functions
DIVISION OF R & D RESOURCES
Division Advisory Group
Division Director for R & D Resources
(GS-17 or equivalent)
Manpower Programs
Institutional Programs
Linkage Programs
Information Systems Programs
DIVISION OF EDUCATIONAL PRACTICE
Division Advisory Group
Division Director for Educational Practice
(GS-17 or equivalent)
CENTER FOR INSTRUCTIONAL PROCESS
Center Advisory Group
CENTER FOR EDUCATIONAL SYSTEM
Center Advisory Group
CENTER FOR EDUCATIONAL ASSESSMENT
Center Advisory Group
CENTER FOR PROFESSIONAL DEVELOPMENT
Center Advisory Group
DIVISION OF EDUCATIONAL FOUNDATIONS
Division Advisory Group
Division Director for Educational Foundations
(GS-17 or equivalent)
Program of Studies of the Individual Learner
Program of Studies of Group Influences on Learning
Program of Studies of Societal Influences on Education
Program of Studies of Technology and Media
Program of Studies of Methodology of Education R & D

Fig. 5—Internal Organization of Directorate of Research and Development
(Center and Program names are illustrative only)

Staff and Structure

1. The Directorate of Research and Development would be headed by an *Assistant Director for Research and Development*, who would hold a rank of at least GS-18 or equivalent and be appointed by the Institute Director. He would be responsible for major staff assignments, for budget allocations within the Directorate, and for the quality of its program.
2. The Directorate would comprise three divisions, each headed by a division director:
   - o *Division of Educational Practice*, headed by a *Division Director for Educational Practice.*
   - o *Division of Educational Foundations*, headed by a *Division Director for Educational Foundations.*
   - o *Division of R&D Resources*, headed by a *Division Director for R&D Resources.*

   Each division director would be at the GS-17 level or equivalent and be appointed by the Assistant Director. Each would have responsibility for staff, budget, and program within his division. Each division would have a *Division Advisory Group* comprising ten to twenty distinguished individuals from education, R&D, and the public, with demonstrated competence or concern for the division's area of activity. The advisory group would assist the division director in establishing program priorities and overall policy.
3. The Division of Educational Practice would be divided in turn into a number of centers, one for each of the program elements in Program Area II. For example, there might be four centers initially:
   - o *Center for Instructional Process*
   - o *Center for Educational System*
   - o *Center for Educational Assessment*
   - o *Center for Professional Development*

   The number might then expand or contract as appropriate. The centers would be intended to be more permanent than the task forces in the Directorate of Programs. Each center would be

headed by a *Center Director*, a GS-16 or GS-17 position or the equivalent. The centers would support R&D activity in their fields of responsibility but would not conduct it. Each center would have a *Center Advisory Group* drawn from those distinguished educators and scholars with a direct interest and competence in the center's program area. The Center's professional staff would comprise both permanent members and a number of educators or scholars serving one- or two-year temporary assignments.

4. The Division of Educational Foundations would be divided into a number of *Programs of Studies*, one for each of the program elements in Program Area III. For example, there might be five programs of studies initially:
   - o *Individual Learner*
   - o *Group Influences on Learning*
   - o *Societal Influences on Education*
   - o *Technology and Media*
   - o *Methodology of Educational R&D*

   Each program of studies would be headed by a *Program Director*, at a rank of GS-16 or GS-17 or equivalent. The programs would sponsor, but not conduct, R&D in their areas of interest. The program professional staff would comprise both permanent members and scholars serving one- or two-year temporary assignments.
5. The Division of Research and Development Resources would be divided into a number of programs, one for each of the program elements in Program Area IV. For example, there might be four programs initially:
   - o *Manpower*
   - o *Institutional*
   - o *Linkage*
   - o *Information Systems*

   The number could expand or contract as appropriate. Each program would be headed by a *Program Director*, at a rank of GS-16 or GS-17 or equivalent. The programs would develop

fellowship, institutional grant, training, and other support activities intended to catalyze the formation of a strong R&D system in education. The Division Director and the Division Advisory Group would be expected to insure that the activities of these programs are coordinated with those of the other divisions and task forces so that manpower and institutional programs would respond to actual needs. The program professional staff would comprise primarily permanent members, with some school and college or R&D administrators occasionally serving temporary assignments.

The partitioning of the directorate into three divisions coincides directly to the program structure developed in the previous chapter, and within each division the subdivisions correspond to the program elements developed in that chapter. The only unusual provision is the recommendation that the subdivisions of the Division of Educational Practice be called Centers, while those in the other subdivisions be called programs or programs of study. This recommendation is made for two reasons: One, the need for coherent, comprehensive design and management of an R&D program is greater in those complex subject areas intended to affect practice than it is in either the fundamental research or system-building areas; two, these areas are central and continuing concerns of education and for symbolic and intellectual reasons should be associated with a specific continuing organization.

The project selection and funding decision could be handled differently in each division.

The Division of Educational Foundations might follow practices similar to those of NIH or NSF, in which scientific review panels for each program of studies would evaluate projects according to scientific merit; the ranked projects from each panel might then be combined in a single list that goes to the Division Advisory Group for final decisions. To avoid too ingrown a decision-making process, the scientific review panels should include specialists across a wide spectrum of disciplines and both younger and more senior scientists. The review panel on studies of the individual learner, for example, might include psychologists, anthropologists, biologists, linguists, and information scientists.

The Division of Educational Practice, however, might want to depend more on its own professional staff and center advisory groups to develop coherent R&D programs and then to seek appropriate performers. Only part of the program here might be developed according to the NIH or NSF model for basic sciences.

The Division of R&D Resources would probably want to use a variety of mechanisms ranging from fellowships to formula grants to institutional support programs. A variety of different review procedures will be appropriate. The key, however, will be to tie these activities to those of the other divisions, so that research training, for example, will be carried out in conjunction with research.

The program officers in each division would, of course, be expected to be professionally competent in the areas they support. In many cases this would mean a doctorate in a relevant research discipline or comparable R&D experience. In other cases it would imply considerable experience in innovative educational practice. Unless they achieve this kind of competence, their ability to participate in the encouragement and selection of useful R&D projects will be severely limited. To attract such individuals, two conditions must be satisfied: First, stature and salary comparable to that offered by positions elsewhere in government, education, and R&D must be offered; a personnel system comparable to those that have proved effective in NSF and NIH is desirable for this reason. Second, an environment of thoughtful, creative concern for education and of free, exciting interchange of ideas must be established. Part of this is provided by the natural communication among competent individuals; the NIE, however, will have two other features that will help to create this stimulating atmosphere.

First, the participation of program officers from this division on the problem-oriented task forces of the Division of Programs will not only bring together individuals from the two divisions, but will also establish links among officers within the R&D Division that might not occur otherwise. Moreover, it will provide the program officers with an exposure to a larger view of educational problems than they would ordinarily receive.

Second, the participation of program officers from this division in the intramural programs of the Center for Education Studies will keep them in touch with the frontier of education and educational R&D and give them opportunities to refresh their own R&D skills.

These two features of the NIE should help considerably in attracting first-class personnel to its staff, for both permanent and temporary positions.

CENTER FOR EDUCATION STUDIES

The NIE will not only develop and support educational R&D programs, it will also carry some out. The responsibility for these in-house activities will reside in the Center for Education Studies; its organization is shown in Fig. 6.

To carry out its role, which should employ about 5 percent of the Institute's resources (between $5 million and $7 million initially), the Center should be constituted as follows:

Functions

1. To conduct a program of studies of the state of American education.
2. To carry out analyses and evaluations of educational policies.
3. To assist in the design and evaluation of educational R&D programs.

Staff and Structure

1. The Center for Education Studies would be headed by an *Assistant Director for Studies*, who would hold a rank of at least GS-18 or equivalent and be appointed by the Institute Director. He would be responsible for selection of staff and fellows, for the design and conduct of an appropriate and effective program, for coordination with the Directorates, and for budget allocations within the Center.
2. The internal structure of the Center would not be so formal as that of the Directorates. The basic unit of activity would be the *project*, each led by a *project leader* and varying in intensity from one man part-time to a dozen or more men full-time. Projects would form and reform according to the needs of the study effort and the competencies of the resident staff.

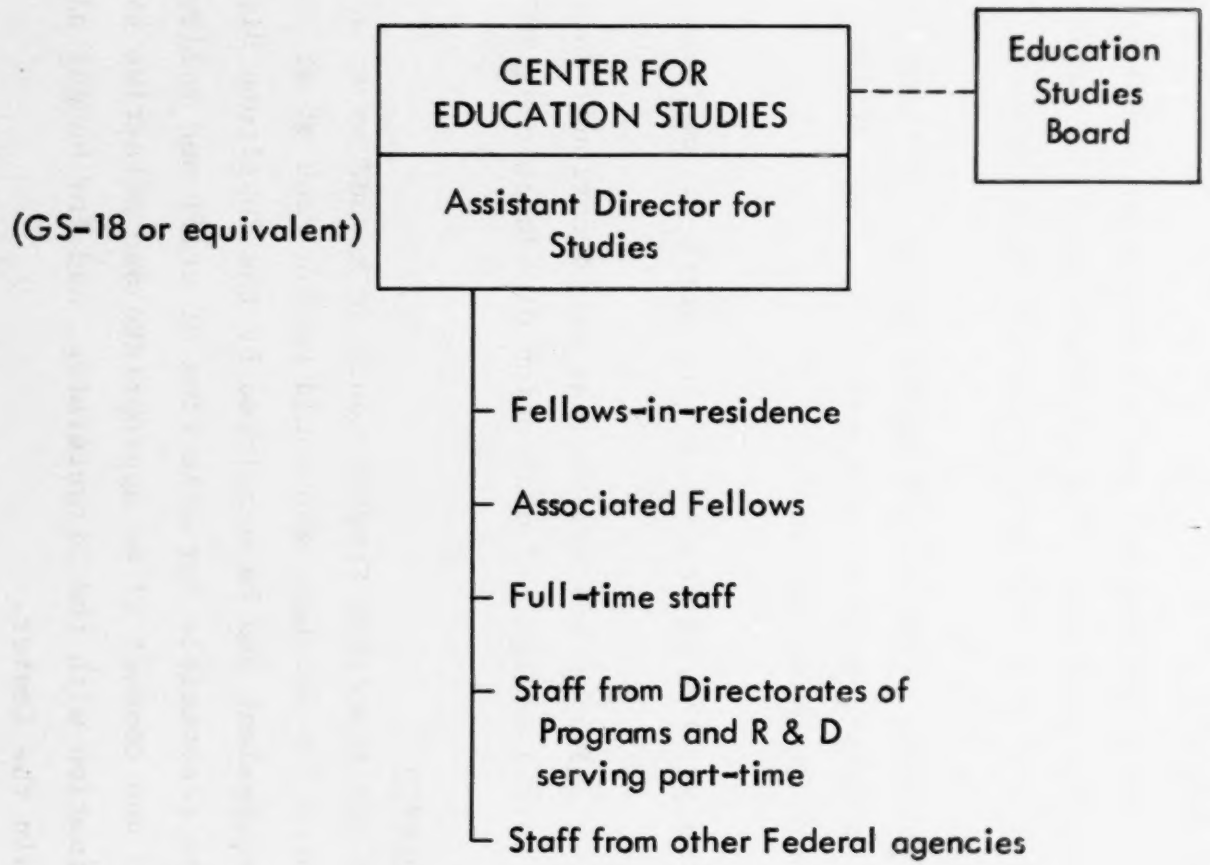

Fig.6—Internal Organization of Center for Education Studies

3. The professional staff would comprise five different groups:
   - o *Full-time staff* of the center, who would be scientists, developers, and educators with a concern for broad questions of education and competence in studying them.
   - o *Staff from the other directorates*, serving part-time as members of project teams to which they bring special knowledge and skills.
   - o *Staff from other Federal agencies*, on a part-time basis, or full-time for a specified period, or indefinitely, to help in coordination of Federal programs.
   - o *Fellows*, both junior and senior, who have been invited to spend from six months to two years at the Center.
   - o *Associate fellows*, both junior and senior, who participate in the Center's projects on a part-time basis while retaining their normal outside affiliations.
4. The *Education Studies Board*, whose members would be distinguished scholars and practitioners of education, would advise the Assistant Director for Studies on the selection of fellows and on the program of studies at the Center.

The functions of the Center are intended to be those of thinking broadly and deeply about the problems, prospects, and goals of American education; of examining current educational policies and priorities; and of reviewing the quality and direction of educational R&D. Its method of operation would be to bring together distinguished educators and scholars, place them in an environment in which they can think freely and join forces naturally, and expose them to the major issues in American education. These scholars and practitioners, from a wide range of disciplines and operating experiences, would be brought together and allowed to mix to form teams and consider topics in a manner that is rarely achieved elsewhere. The result should be better understanding of and recommendations for American education.

To provide a continuity for the Center's efforts and a structure for its project activities, it might establish several major themes, on which work is always under way. Such themes might include the

following:

- o *Illumination of major educational problems:* What is the extent and nature of the problems facing education? To what reality do the headlines correspond?
- o *Evaluation of evaluation:* What is the state of educational evaluation? How can it be improved? How can it be more closely related to educational objectives?
- o *Educational goals:* What might the goals of education be? How can each community establish its own? How do they relate to state and national goals?
- o *Educational policies:* How effective are current Federal educational policies? How might they be improved?
- o *Educational R&D:* What is the state of educational R&D? What are its deficiencies? How can it be improved?

The staff of the Center is intended to be chosen on the basis of accomplishments and promise in educational R&D or practice. The intent is to bring together in a single place scholars and practitioners, social scientists and technologists, young people of promise and older people of achievement, specialists and generalists.

Part of the staff would be permanent. These would include senior professionals, covering a range of disciplines or practical backgrounds, and junior professionals, providing many of the technical and analytical skills needed to fill out project teams.

Another portion of the project staff would comprise professionals from the other Directorates and other Federal agencies, who would bring their special expertise to the project teams and benefit from the opportunity to participate in an active study.

About half of the Center staff would comprise junior and senior fellows, selected on the basis of their accomplishments and potential for future achievement. These would be six-month to two-year appointments, intended to maintain a flux of staff from the R&D and education communities through the NIE. The NIE would benefit from the new ideas and competencies brought in by the fellows and from their first-hand knowledge of the realities of R&D and practice. The fellows would benefit from the stimulation of new surroundings and fellow workers

and from the high-quality, though informal, education they would receive. They would return to their institutions or school systems better informed about the NIE's programs and the breadth of American education.

Some individuals who are qualified to be resident fellows might find it difficult to obtain a leave from their home institutions. In order to enable them to participate to the extent they can, the NIE would have associate fellows. They would be considered part of the NIE staff and brought to the Center for shorter periods during the year as their availability permits.

As the Center for Education Studies develops, it may be desirable to establish a greater degree of internal structuring and a more formal series of programs. However, those decisions would be better made after some experience has been accumulated.

ORGANIZATIONAL ALTERNATIVES

In developing an organizational structure for the NIE, a number of alternatives were considered and rejected. The three principal ones were:

- o *Multiple Institutes*, on the model of the NIH
- o *Large intramural program*, on the model of the National Bureau of Standards
- o *Regional Institutes*

The advantages and disadvantages of each are described below.

Multiple Institutes., Both Krathwohl's and the Commission on Instructional Technology's proposals, mentioned in Chapter I and summarized in Appendix A, call for the creation of National Institutes of Education with a central coordinating staff and a number of subinstitutes. The Commission recommended a National Institute of Instructional Technology. Krathwohl suggested the possibility of a National Institute of Urban Education and a National Institute of Education for the Handicapped. Both conceive of each Institute conducting and supporting extensive research, development, and application activities in its area of concern.

The principal advantages of such an arrangement are:

- o The possibility of organizing comprehensive programs of

research, development, and application, employing a wide diversity of skills, addressing a major area over a long period of time;

- The enhanced ability to develop powerful constituencies in support of R&D programs in a particular area; and
- The program stability and focus that institutionalization would bring.

Against these, the following disadvantages must be balanced:

- The reduction in staff and budget flexibility that would occur if each Institute were to operate semiautonomously on the NIH model;
- The reduction in intercommunication and coordination (and the increased chances of overlap) that would be encouraged by the natural desire to develop complete programs in each Institute;
- The difficulty of defining appropriate topics of interest for individual Institutes (Instructional Technology or Instructional Process, Urban Education or the Disadvantaged, Higher Education or Educational Finance);
- The dispersion of intramural effort among several Institutes;
- The possibility of institutionalizing problems that turn out to be transitory or closely linked to problems studied by other Institutes; and
- The dispersion of staff and effort during NIE's early development.

As the NIE grows and understanding of appropriate management structures for educational R&D increases, it may become desirable and feasible to divide it into several Institutes. However, on balance, it seems advisable in the early years to retain the flexibility and compactness provided by a single Institute.

Large Intramural Program. A second possibility for the NIE would be the establishment of a very large intramural program, spanning research, development, and application in most of the disciplines and subjects concerning education.

The advantages of this organization would be:

- The creation of a "capstone" R&D performance organization of a

breadth and diversity unmatched anywhere else and able, therefore, to undertake educational studies of a type and quality currently unattainable;

- The enhanced attraction for top-quality individuals to join the NIE, both in the intramural program and as extramural program officers, that would come from the reputation and intellectual excitement provided by an excellent intramural R&D activity; and
- The enhanced reputation of educational R&D that would derive from a highly visible, highly competent national research and development organization able to attract a diversity of talents and disciplines to studies of education.

The disadvantages would be:

- The general shortage and maldistribution of experienced and competent R&D personnel and managers in education would be worsened in the short run by their attraction away from universities, educational laboratories, and educational agencies to the NIE;
- The difficulty of recruiting for and managing a high-quality intramural R&D enterprise would divert NIE management attention away from the development of a strong extramural program and the development of strong R&D institutions elsewhere;
- The danger of developing an R&D enterprise that is divorced from the realities of education and close association with actual school systems and learners; and
- The possibility of developing a single, dominant educational R&D organization.

Again, the balance appears to lie against the establishment of a *large* intramural program at the beginning of the NIE. The course chosen has been to start with a small intramural program, in the form of the Center for Education Studies, whose focus would be on activities not now being performed, of national or broad educational importance. As the NIE and the external educational R&D community grow, it might be appropriate to expand the NIE's intramural program. The recommended organization leaves that option open.

Geographically Distributed Institutes. A third organization that has been considered during the planning is a series of Institutes distributed around the country.

The advantages of this structure would be:

- o Location of R&D facilities closer to the state and local educational agencies who face the problems and must use the products of the Institute's work;
- o The likelihood that alternative approaches would be explored at different Institutes, providing diversity and competitive cross-checks; and
- o Responsiveness to local and regional problems and development, and therefore, of strong local constituencies.

The disadvantages would be:

- o The shortage of management and R&D talent makes it difficult to staff several such Institutes;
- o Many problems are national in scope and their study and resolution should be organized and supported nationally;
- o Regional distribution does not necessarily lead to close association with regional problems; and
- o The Institutes would compete with existing local and regional agencies (such as the Regional Educational Laboratories) which should be strengthened.

Again the balance of arguments appears to be in favor of a single National Institute at the beginning. A major part of that Institute's efforts should be devoted to strengthening regional institutions and their linkage with state and local agencies. Among the most important of those institutions are the Regional Educational Laboratories. As the NIE develops, these Laboratories might come to play the role of Regional Institutes.

V. RELATIONS WITH THE EDUCATIONAL SYSTEM

If the NIE is to be successful in linking R&D with practice, it must pay careful attention to establishment of appropriate relationships with the numerous and diverse institutions and personnel who constitute the educational system.

The *institutions* include almost 18,000 school districts, 2,500 colleges and universities, thousands of private educational organizations, 50 state departments of education, over 800 teacher-training institutions, several hundred professional associations and unions, a half-dozen Federal agencies, several tens of independent R&D institutions, and a number of interstate consortia and compacts. The *personnel* include 60 million students, 3 million teachers, several hundred thousand administrators, and over 5,000 researchers and developers.

Obviously, the NIE itself cannot be in contact with more than a small sample of these institutions and individuals. However, it must develop mechanisms to identify the issues facing the various parts of the educational system and to transfer the products of R&D into practice. And it must encourage and facilitate the development of such mechanisms throughout the educational R&D system.

The form those relationships might take with each of the major constituents of the educational system is described in this chapter. After a discussion of general principles, relationships with the following groups are discussed:

- Office of Education
- Other Federal agencies
- National Foundation on Higher Education
- State agencies and interstate consortia
- Local agencies
- Private and nonformal education organizations
- Regional Laboratories and R&D Centers
- Schools of education
- Colleges and universities
- Scientific and professional societies

PRINCIPLES FOR RELATIONSHIPS

The philosophy that underlies the following detailed discussions may be summarized in a few statements:

- o *The flow of information must be in both directions.* The question is not only the dissemination of R&D products to the field, it is just as importantly the determination of R&D needs from the field.
- o *The flow of information must be continuous.* It is not sufficient to determine that a problem exists, undertake an R&D program, and then present its results to the prospective user. The interchange between R&D and practice must continue throughout the R&D activity.
- o *The flow of information occurs most effectively through individual contact.* Although printed reports, journals of abstracts, and comparative evaluations are important, studies of innovation show clearly that the most effective form of information transfers is from person to person. In practice, this means that if R&D findings are to reach an educational agency and if that agency's problems are to benefit from R&D, there should be individuals with R&D interests in close association with the agency.
- o *The flow of information must occur at all levels.* The occasional deliberations of high-level advisory groups are not sufficient to achieve close relationships between R&D and practice. Rather, there must be a constant flow of people and ideas between the systems at every level and at many points.
- o *Practitioners will be more interested in and hospitable to R&D activities if they have some responsibility for them.* Two meanings of the term "responsibility" are intended here: The first is the responsibility that a chief state school officer, local superintendent, or college president would feel for R&D that his institution had commissioned on issues or problems of immediate concern to it. The second is the responsibility that a teacher would feel for a new curriculum that he helped to develop or adapt to his school system's needs. Experience in

other fields has shown that such responsibility for R&D facilitates the adoption of its results.

- o *No single mechanism or set of mechanisms for contact is sufficient; many ad hoc devices should be employed.* Advisory committees, reports, journals of abstracts, traveling exhibits, demonstration facilities, personnel exchanges, conferences, "county agents," and many other devices contribute to the proper exchange of information and attitudes. The NIE should not rely on any single, prescribed "dissemination" system; it should aspire to a rich network of relationships comprising many different kinds of linkage.

OFFICE OF EDUCATION

Many of the individuals and groups consulted during the planning study expressed concern about the relationship between the OE and the NIE. (The alternative forms that this relationship might take are discussed in Chapter IV, *Organization*. This discussion assumes that the OE is parallel to the NIE and has principal responsibility for educational assistance programs.) Some feared that the division of authority would make "bureaucratic" problems more severe; some envisioned an uncoordinated Federal educational policy; some felt that the OE would lose the benefits of R&D directed to its programs' problems. These are potential problems that must, indeed, be faced and resolved during the NIE's creation and early years of operation. The *objectives* should be to create a relationship that results in:

- o Consistent Federal educational policies.
- o Minimization of bureaucracy as seen by private, local, and state agencies.
- o NIE programs responsive to OE needs.
- o OE implementation of the results of NIE programs.

Among the *means* to achieve these objectives are:

- o The designation by the Secretary of HEW of one official to oversee both the OE and the NIE and be responsible for the coordination of their policies (this could be the Commissioner of Education).

- o The participation of OE officials as members of NIE advisory councils, groups, and boards.
- o The participation of OE staff members at the NIE Center for Education Studies and on the NIE task forces.
- o Establishment of a system of standing committees with joint membership from NIE and OE to develop coordinated R&D and assistance programs in major areas of concern, such as the disadvantaged, vocational education, higher education, and so on. One function of these committees might be to see that NIE's program activities and findings are linked to OE's large demonstration programs for tryout.
- o The assignment of NIE staff members on tours of duty in OE bureaus.
- o The provision in each OE bureau of a small mission-oriented research, development, planning, and evaluation staff.

The last suggestion is the only controversial one. It follows, however, from the belief that linkage will occur most naturally through individuals with R&D competency. The bureau-based staff would be expected to remain in close contact with the NIE staff, to be aware of NIE programs of relevance to their bureau, to encourage the initiation of modification of programs to serve the bureau's needs, and to adapt the results of R&D programs to the bureau's situation. They would also undertake or support studies and analyses directly relevant to the bureau's interests. They would not undertake large-scale or long-term programs of general educational relevance. The bureau's capability to undertake its own R&D activities will keep it from having to go to the NIE to satisfy every immediate requirement (with the mutual dissatisfaction that is bound to result) and will make it a much more interested and knowledgeable user of the NIE's services. The Secretary's designee should insure that the bureau programs do not exceed their proper scope and do not duplicate NIE activity.

OTHER FEDERAL AGENCIES

Education and educational R&D are the concern of several other Federal agencies. The most notable existing agencies are the NSF, the Office of Child Development of HEW, the OEO, the National Institute of Child Health and Human Development of NIH, the National Institute of Mental Health, the National Foundation on the Arts and Humanities, the Department

of Defense, and the Department of Labor. The NIE must establish linkages with these Federal agencies also.

The *objectives* of its relationships should be:

- To insure that the national educational R&D effort avoids duplication, provides a coherent attack on major problems, and includes enough diversity to insure that promising alternatives will be explored and that no single point of view predominates.
- To insure that the NIE's efforts respond to the needs of these Federal agencies and that its results reach them.

The *means* of achieving these objectives should include:

- Maintenance and distribution by the NIE of information on all educational R&D activities sponsored or conducted by Federal agencies. (This would support the requirement that the National Advisory Council prepare an annual report on the status of educational R&D.)
- Formation of an interagency committee on educational R&D chaired by the NIE to facilitate exchange of information and joint planning among the several agencies. This committee should identify areas of specialization for each of the agencies and seek to assure that duplication of effort is avoided.
- Conduct of projects having joint interest under joint sponsorship of several Federal agencies.
- Participation by staff from the Federal agencies in the program of the Center for Education Studies and on the problem-oriented task forces.
- Evaluations by the NIE, especially the Center for Education Studies, of Federal educational programs that cut across agencies.

NATIONAL FOUNDATION ON HIGHER EDUCATION

The Administration has proposed creation of a National Foundation on Higher Education (NFHE) as a means of providing discretionary funding "to encourage excellence, innovation, and reform in higher education; to strengthen postsecondary educational institutions or courses of instruction that play a uniquely valuable role in American higher education or that are faced with special difficulties; and to provide an organization concerned with the development of national policy in higher education." As initially proposed, the Foundation would be constructed on the model of the National Science Foundation--a semiautonomous agency governed by a Board and a Director appointed by the President. If the NFHE is

authorized by the Congress, a close relationship between it and the NIE will be important.

The *objectives* of the relationship should be to insure that:

- o Federal higher educational policies are consistent.
- o NIE programs are responsive to NFHE needs.
- o NFHE facilitates the introduction into practice of improvements and reforms developed under NIE sponsorship.

Among the *means* to achieve these objectives are:

- o Participation of NFHE officials as members of NIE advisory councils, groups, and boards.
- o Participation of NFHE staff members at the NIE Center for Education Studies and on the NIE task forces.
- o Establishment of joint committees from NIE and NFHE to develop coordinated R&D and implementation programs in higher and post-secondary education. (The NIE would fund the research, development, demonstration, and evaluation of an innovation; the NFHE would fund its introduction into practice on many campuses.)
- o Participation by NIE staff members on tours of duty in the NFHE.
- o Participation by NIE officials in NFHE advisory councils.

Like the OE, NSF, OEO, and DoD, the NFHE might also sponsor some educational R&D activities of direct and immediate relevance to its programs and concerns. However, the Foundation's principal emphasis would be on providing the discretionary support that enables educational improvements and reforms to enter practice. The Institute would help to develop innovations in higher education; the Foundation would help to implement them.

STATE AGENCIES AND INTERSTATE CONSORTIA

The practice of education is the responsibility of the state and local agencies. Most innovation and reform must occur through these agencies. Close and continuous relationships between these agencies and the NIE is essential.

The *objectives* of the relationships should be:

- o To insure that the national program of R&D activities responds to the needs of the states.

- To insure that the results of educational R&D are made available to the states in a useful form.
- To facilitate the active participation of state agencies in educational improvement and reform through R&D.

Among the *means* of achieving these objectives are:

- Participation by chief state school officers and their staffs in the Advisory Council and other advisory groups and boards of the NIE.
- Participation by chief state school officers and their staffs in the activities of the Center for Educational Studies. (The associate fellows program described in Chapter IV is intended for state and local officials who might not be able to spend an extended continuous period away from their jobs.)
- Support by the NIE for strengthening the role of the state agencies in the demonstration and dissemination of educational innovations. (This might be done in conjunction with the OE.)
- Support by the NIE for the development of R&D competencies in state agencies *and* for their support of R&D activities responsive to their needs in universities, R&D centers, Regional Laboratories, and independent agencies. (The NIE might work with OE to develop a partial grant program to state agencies for these purposes.)
- Support by the NIE for training programs for R&D and analytical staffs in state agencies, both for those already in the agencies and to prepare new professionals for such positions.
- Sponsorship by the NIE of activities intended to develop analytical tools (such as improved information systems) for state agencies.

A number of these activities in support of state agencies have been included in Program Area IV, *Strengthening the R&D System*, described in Chapter III.

In addition to the state educational agencies, there now exist a number of interstate consortia or commissions that include education among their concerns. These include the Education Commission of the States (which is conducting the *National Assessment of Educational Progress*), the Western Interstate Commission on Higher Education, the Southern Regional Education Board, and the New England Board for Higher Education. The NIE should include these agencies in its activities through the use of mechanisms like those noted above.

LOCAL AGENCIES

The need to establish close relationships with representative local educational agencies and higher educational institutions is evident. *Much of what has been said about state agencies applies in this instance as well, with the appropriate substitution of terms.* Superintendents, school board members, principals, teachers, students, community representatives, and parents should be represented in the several councils of the NIE and, more generally, in the councils of the many R&D instrumentalities it supports.

In addition to the objectives and means described in the discussion of state agencies, the NIE should consider the following *means* of establishing relationships with the local agencies and their personnel:

- Encouraging the formation of interdistrict consortia to sponsor or conduct R&D activities of mutual relevance to the districts. The NIE and OE might help fund and train staffs for such consortia. The consortia could contract with universities, Regional Laboratories, or other independent organizations for R&D assistance.
- Encouraging the participation of principals and teachers in NIE-sponsored R&D projects and in the work of the NIE's Center for Education Studies and program task forces.
- Facilitating the formation of local agencies, like the Teachers Centers in England, through which innovative practices could be disseminated. Especially important is the development of techniques whereby practicing teachers can be engaged in R&D activities, familiarized with the results of R&D and helped to translate them to meet their local needs.
- Developing mechanisms whereby teachers and principals and other local officials can help in determining the problem areas and priorities for educational R&D.

This set of relationships is the most crucial and the most difficult for the NIE to establish. Considerable effort should go into establishing them, especially during the Institute's early years.

PRIVATE AND NONFORMAL EDUCATIONAL ORGANIZATIONS

Educational institutions outside of the conventional, formal structure are increasingly important parts of the educational system. They include such agencies as job corps centers, profit-making technical

schools, Children's Television Workshop and other television agencies, textbook publishers, and educational technology companies. The NIE must be concerned with these nonconventional forms and formers of education as well.

Its *objectives* should be:

- o To be aware of the problems and needs of these portions of the educational system and to develop program activities that respond to them.
- o To make the results of its activities available to these agencies, as appropriate, and to those in government agencies who are concerned with regulation of this sector.

The principal *means* of doing this would be:

- o Participation by representatives of these agencies on appropriate NIE councils, groups, and boards.
- o Participation by staff members of these agencies in the activities of the Center for Education Studies.
- o Study by the NIE of these agencies, their needs, and their prospects.

REGIONAL LABORATORIES AND R&D CENTERS

One of the major deficiencies of the educational R&D system and, most particularly, of its linkage with the educational system, has been the lack of institutions in which interdisciplinary, developmental, and applied activities might be undertaken. An attempt was made to alleviate that problem with the creation of university-based R&D Centers and independent, nonprofit Regional Laboratories during the mid-sixties. These kinds of institutions, as well as other independent research organizations that have turned their attention to educational problems, will be essential constituents in the R&D enterprise supported by the NIE and especially important links between it and the educational system.

In the beginning there were 20 Regional Laboratories and 8 R&D Centers. The number of laboratories has been reduced in two stages, to a total of 11 in FY 1972, as a result of budget limitations and apparent dissatisfaction with the performance of some laboratories. At the same time, funding uncertainties and management constraints have hampered the ability of even the effective laboratories to develop

first-class staffs and to transfer programs into practice. The NIE will take over the principal funding of the laboratories and centers. When it does so, it should aim to create a more mutually satisfactory relationship between the sponsoring agencies and the university-based and independent research institutions.

The *objectives* of the relationship should be:

- o To insure that an adequate number of institutions exist in which interdisciplinary, developmental, and applied educational R&D activities can take place.
- o To insure that the R&D activities in those institutions respond to the needs of the educational system and that their findings and products reach practice.
- o To insure that, subject to the requirements that their performance be satisfactory, the institutions are provided with sufficient funds, information and authority to permit effective staff and program development to occur.

Among the *means* of achieving these objectives would be:

- o Creation of additional laboratories, centers, and other independent agencies as the needs for new ones are demonstrated. (It is unlikely that the existing complement is adequate to meet education's needs. Even as support is withdrawn from some institutions, support should be provided to groups to develop new institutions to satisfy still unmet needs.)
- o Institutional support should be a major portion of an institution's budget only in the first few years and only to catalyze its growth. After that period, the majority of an institution's budget should be program support, obtained in some form of competition with comparable institutions. The remainder of the budget should be institutional support funds provided as some portion of program funds to be used for supporting research, staff and program development.
- o Multiple sources of support for the laboratories and other applied research and developmental organizations should be encouraged. Having the organizations work for other Federal agencies, state agencies, and local agencies will enhance their ability to link R&D with practice, provide additional evaluations of their quality, and reduce their dependence on and sensitivity to the program choices of a single agency.

The thrust of these recommendations is to reduce the one-to-one mutual dependence that now exists between the laboratories and centers and NCERD. The NIE would see its role as a catalyst to the creation of the institutions necessary to an effective R&D system and as a

supporter of R&D at those institutions once they have passed through a beginning stage. But its obligation to them would be finite in extent. Upon reaching maturity, each institution would be expected to seek program support from multiple sources in competition with other R&D institutions. Institutional support funds would be provided only as a proportion of program funds.

SCHOOLS OF EDUCATION

Educational improvement and reform depend on changes in teacher performance. Central to the achievement of such changes are the schools of education and teachers colleges, where many teachers are prepared. The NIE's relationship with teacher education must be close.

That relationship should be guided by three *objectives:*

- To insure that the results of educational R&D are suitably reflected in teacher education.
- To insure that the problems of teacher education itself are the subject of appropriate study and development.
- To help strengthen the R&D capability at schools of education.

Among the *means* of achieving these objectives are:

- Participation by personnel from teacher-education institutions and associations on NIE advisory councils, groups, and boards. (Of special relevance in this instance would be the Center for Professional Development that has been described in Chapter IV.)
- Participation by personnel from teacher-education institutions and associations in the activities of the Center for Education Studies. (An individual might spend a sabbatic year with a joint appointment at the Center for Professional Development, where he would help in the management of the extramural R&D program, and at the Center for Education Studies, where he would participate in intramural studies involving teacher-education questions.)
- Development of a strong program of activities focusing on teacher education in the Center for Professional Development directly, and throughout the other NIE programs indirectly. (See especially Program Element II-4 in Chapter III and other activities mentioned throughout the program.)
- Encouragement of the restructuring of schools of education so as to bring educational R&D, educational practice, and teacher education into closer conjunction.

COLLEGES AND UNIVERSITIES

Institutions of higher education play several roles in the NIE's field of interest. They are providers of education; they train the personnel who provide education; they perform educational R&D; they train the performers of educational R&D; and they are the subject and users of educational R&D. Almost everything the NIE undertakes must be in some relationship with colleges and universities.

Directing these relationships should be the following *objectives:*

- o To undertake R&D activities relevant to the needs of higher educational institutions.
- o To insure that the results of R&D activities are made available to the institutions for their own use, when appropriate, and for inclusion in their teacher-education programs.
- o To support and strengthen the education-relevant R&D capabilities of the colleges and universities, not only in the schools of education, but throughout the campus.
- o To support and strengthen the education-relevant R&D personnel training capabilities of the colleges and universities, not only in the schools of education, but throughout the campus.

Among the *means* to achieve these goals are:

- o Participation by students, faculty, and administrators from colleges and universities on NIE advisory councils, groups, and boards.
- o Participation by students, faculty, and administrators in the activities of the Center for Education Studies (that is, members of these groups would be eligible for appointment as junior or senior fellows).
- o Encouragement of the formation of agencies (such as the Western Interstate Commission on Higher Education R&D groups) to work on the R&D needs of higher education.
- o Provision of consistent, adequate support to competent university-based educational R&D activities.

SCIENTIFIC AND PROFESSIONAL SOCIETIES

There already exist a wide variety of organizations whose principal role is the establishment of communication among dispersed professionals with common interests. These are the professional and scientific societies in education and R&D. Among them are such groups as the National Education Association, the American Council on Education, the American

Educational Research Association, the American Mathematical Association, the American Psychological Association, National Science Teachers Association, American Association of Colleges of Teacher Education, and the American Association of School Administrators. These organizations are exceptionally important and useful channels of communication to and from the various disciplines and interest groups in education and R&D. The NIE should strive to employ these channels both to convey the results of R&D and to find out about needs and opportunities.

The *objectives* of the NIE's relationships with these groups should be:

- To strengthen their role as transmitters of information within the R&D community, within the education community, and between the two communities.
- To strengthen their role as links between the NIE and its several constituencies.
- To strengthen the role of the scientific societies in raising the quality of educational R&D.

The *means* of achieving these objectives include:

- Participation by professional and scientific society representatives on NIE advisory councils, groups, and boards.
- Sponsorship of society-organized journals, conferences, and critical reviews related to the NIE's interests.
- Use of existing society journals, meetings, and related activities to convey R&D results and to determine R&D needs and opportunities.

Since society members will almost always have some other education or R&D association, the web of relationships between the NIE and the societies will be much more complex than this listing might suggest.

VI. INITIAL ACTIVITIES

The preceding chapters have described what the NIE might become. This chapter discusses how, if the Congress authorizes its formation, it might get there. At its inception the NIE will face four major issues:

- o What should its initial program be?
- o How can it acquire first-quality staff?
- o How large should its budget be?
- o How should the transfer of responsibilities from the current NCERD to NIE occur?

INITIAL PROGRAM

The most important initial decisions, save the choice of a Director, concern program. From among the wide range of possibilities, only a portion of which have been displayed in Chapter III *(Program)*, there must be selected a reasonable number of priority areas on which the Institute can focus its initial efforts. These must satisfy the criteria of worth and balance identified earlier. Most especially, they must promise some early practical returns.

Not only the substance of the program but also the method by which it is developed and the individuals who are involved in its development are important. The Institute should quickly establish its concern for its constituencies and for quality. This means that a wide range of highly respected and knowledgeable individuals from R&D and practice should participate in planning the NIE's initial program.

An appropriate way to proceed would be to develop an *Agenda for Educational Research and Development*. A planning staff and advisory council, aided by panels of consultants, would examine each of the major areas of educational R&D. They would review prior and current work, identify what needs to be done, and define desirable programs of work in each area. The staff and advisory council would then merge the programs in each area into a coordinated program and recommend program priorities. Members of the consultant panels and the advisory council would be chosen from distinguished educators and scholars. This activity would take

between six months and a year, but because of its general importance for educational R&D, it should be begun even before the NIE is authorized.

The results of this effort would also assist in the Institute's initial staffing (some panel members and staff, and those they recommend, might be asked to join the NIE), in budget planning (the panels would be asked for budget estimates for their program recommendations), and in the transfer of responsibilities from the NCERD (the panel reports could guide NCERD's program during the transition period to the NIE).

INITIAL STAFFING

The choice of a Director is the crucial staffing decision. His ability to attract other first-class individuals to fill major positions, his judgment in making program decisions, and his competence in describing program achievements and needs to the several constituencies will determine the Institute's success. And, of course, he must have the confidence of officials in the executive branch and in the Congress. These requirements seem to point to an individual of demonstrated competence in R&D and in administration. Implicit, as well, is the desirability of his appointment being made without the intrusion of partisan political considerations.

A successful NIE program will require the cooperation of a number of disparate communities: practicing educators; "traditional" educational researchers; natural, social, and behavioral scientists; humanists; artists; and technologists. A major responsibility of the Director will be to bring these groups together in new ways. For that reason it is essential that he be a highly competent and widely respected person whose stature and reputation are such as to raise him above factional differences among these groups.

The Director should choose his deputy and assistant directors and work with them on other major staff choices. It would be desirable to bring many of the initial staff on for two-year appointments. And, as noted above, should an agenda development activity be undertaken, its participants might become staff members or help in identification of prospective staff.

INITIAL BUDGET

A major part of the NIE's initial budget will be funds currently planned to be expended by NCERD. About $130 million* of the FY 1973 plan total would be transferred. The major question is, How much of an increment should be added? There are two viewpoints.

The first argues that the initial budget should contain a large increment because:

- o The problems are large and the current effort is far too small;
- o A small initial increment will make subsequent growth more difficult; and
- o The size of the budget increment indicates the seriousness with which the Congress and the administration view the Institute.

The second maintains that slower, steady growth is the proper course for the NIE because:

- o Personnel, managerial, and institutional resources are too limited to spend a large increment wisely;
- o A large, poorly expended initial increment will make subsequent growth difficult (witness the difficulties with earlier R&D institution building); and
- o It will prove sufficiently challenging to expend existing resources and a small increment wisely.

These opposing viewpoints demand the specific discipline of designing a detailed R&D program, including identification of its prospective performers, for appropriate resolution. This is another reason for encouraging an early development of an agenda for educational R&D, with budget figures.

Short of such a program, budget estimates must rely heavily on judgment. The judgment expressed at the NIE planning meetings might be summarized as follows: The first-year increment should be around $25 million. Five years after inception, the NIE's budget should be

*Based on preliminary planning figures, which might change during the budgetary process.

able effectively to employ at least a $250 million increment. (This total would still represent less than 1 percent of education's contribution to the GNP.) A tenth-year increment of $1 billion would begin to create an engine of improvement and reform large enough to move the education system. Table 9 summarizes those figures and some intermediate steps, assuming that the NIE begins full-scale operation in FY 1973.

Table 9

BUDGETS FOR NIE
($ millions)

Budget	Fiscal Year									
	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Baseline budget	130	130	130	130	130	130	130	130	130	130
Budget increment	25	50	100	175	250	375	500	650	800	1000
Total	155	180	230	305	380	505	630	780	930	1130

TRANSFER OF RESPONSIBILITIES

Most of the budget authorities that are currently the responsibility of the NCERD should be transferred to the NIE. The result would be, as noted above, the transfer of about $130 million from the FY 1973 *planned* budget. This does not mean that the programs currently being supported by NCERD need also be transferred.

The authorities transferred should include:

- o General research, covering a wide variety of solicited and unsolicited research activities, including the regionally sponsored research grants program;
- o Targeted research--five activities intended to develop coordinated R&D programs on early childhood, reading, vocational education, organization and administration, and higher education;
- o R&D Centers and Regional Educational Laboratories;
- o Experimental schools;
- o Research training;

- o Research on dissemination;
- o Construction of R&D facilities; and
- o Overseas research.

Evaluation and policy-oriented research applied to the programs of the OE should remain in the OE, as should the collection of educational statistics by the National Center for Educational Statistics (NCES).

Dissemination services provided by the National Center for Educational Communications (NCEC) will be important for both the OE and the NIE. Thus, the NCEC should remain in the OE but be responsible for serving both the NIE and the OE. The NIE, however, should undertake the program of research into the process of dissemination (and, more generally, the process of innovation and reform) that the NCEC has been sponsoring. And the NIE may want to request the development of additional services from the NCEC.

The transfer of funding authority from the NCERD to the NIE should occur all at once, in order to avoid the disruption within the NCERD and in the outside community that a prolonged transfer would incur. To permit this passing of responsibility to take place smoothly, it seems appropriate to plan on the timetable shown in Table 10 (if the NIE is authorized during calendar year 1971).

Table 10

TRANSITION CALENDAR FROM NCERD TO NIE

Agency	Responsibility	
	FY 1972	FY 1973
NCERD	Manage current program; consult with NIE staff on new starts and future planning.	All programs transferred to NIE.
NIE	Hire staff and develop program and organizational plans; consult with NCERD on new starts and future planning.	Manage full program.

Appendix A

PREVIOUS PROPOSALS FOR NATIONAL INSTITUTE(S) OF EDUCATION

There have been several calls for the establishment of a distinct national agency devoted to the conduct and support of educational research and development. Because they respond to the same set of circumstances that led the Administration to propose creation of the NIE, the two most recent proposals--those by David Krathwohl and by the Commission on Instructional Technology--deserve careful examination.

THE KRATHWOHL PROPOSAL

In his Presidential Address before the Annual Convention of the American Educational Research Association in February 1969, Dean David Krathwohl called for the creation of National Institutes of Education, separate from the Office of Education, but reporting to the Assistant Secretary for Education.

"The National Institutes of Education would consist of a central coordinating staff which would, like NIH, work with a series of institutes, each focused on a critical education problem. Each institute staff would develop the best possible research, development, dissemination, and installation program to solve the education problem for which it would be responsible. It would carry out the program largely by working with those in educational institutions, industries, and laboratories with appropriate capabilities. In-house research would be carried on only if there were clear advantages. Problems around which an institute would be constituted could be as broad as urban education, or as circumscribed as the program now carried on by the Bureau of the Handicapped."[1]

In that speech, in a subsequent editorial in *The Journal of Educational Research*, and in testimony before Congress, he enumerated the *advantages* of such a proposal.

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[1]The quotes here and throughout this appendix are from Krathwohl's address; his testimony before the General Subcommittee on Education of the House Committee on Education and Labor in March 1970; and his editorial in *The Journal of Educational Research*, December 1969.

First, "it could provide a kind of stability for planning and carrying out programs that is lacking in the USOE, which changes both top personnel and orientation with each new administration.

"Second, by combining on its governing board such persons as researchers, professional educators, superintendents, and state department of education personnel, it would have the advantage of providing the forum for mutual education and the basis for a sense of community that are now lacking.

"Third, there is greater likelihood that, as an off-the-executive-line agency which is one step removed from the pressures, it could resolve the priorities issue of which problems have a combination of high social need and appear amenable to a research attack."

Fourth, "it provides for a visible focusing of effort on a given problem." ..."For instance, given a problem such as urban education, one could identify the sociologists, psychologists, economists, political scientists, as well as educational researchers, with interests and ideas bearing on the problem. There would be a ready and concerned clientele in the schools that would benefit from such a focused effort; they, in turn, would be interested in helping to set priorities and advise on development."

Fifth, "the Institutes, like NSF, would take responsibility for the nurture and growth of the manpower and physical resources necessary for research, development, dissemination, and installation, so that these could be developed and used in the wisest possible way for the improvement of education. This concern is at a very low level now in the USOE.

"Sixth, by removing these programs from the Office of Education, it would prevent the continually threatened break-up of the Bureau of Research.

"Seventh, it would, of course, make coordination with the programs of the Office of Education more difficult. But...concern with the problems of education is spread throughout government. It is possible that a less proprietary attitude could be built into the new Institutes so that greater cooperation among the Federal agencies would be possible."

Krathwohl also considered some possible *disadvantages*.

First would be "the difficulty of coordinating the program across the Institutes for the good of education as a whole.... Related to this is the concern that a 'party line' might develop in a focused program, such as the National Cancer Institute has been accused of. Only research with certain orientations then receive [sic] support. For this...the best answer lies in the choice of staff with broad vision and the appropriate choice and use of panels and committees to maintain appropriate perspective."

Second, there is the concern "that the establishment of such a set of Institutes would further divorce education from the social sciences on which much of its research program depends.... Regardless of where educational research is located, it will now need to coordinate with the social science wing of NSF."

Third, there is the concern with "the threat of Federal control of education which the in-house research capacity of such a unit poses.... However, there appear to be enough checks built into the government appropriation machinery that this is probably more a potential threat than a real one."

REPORT OF THE COMMISSION ON INSTRUCTIONAL TECHNOLOGY

In its report, presented in August 1969, the Commission on Instructional Technology made six recommendations. For the purposes of this study the first two recommendations and their associated justifications are of greatest interest. Recommendation No. 1 concerns the establishment of National Institutes of Education, and Recommendation No. 2 proposes the establishment of a constituent institute, a National Institute of Instructional Technology.[2]

Recommendation No. 1

> "A new institution--the National Institutes of Education (NIE)--should be established by Congress within the Department of Health, Education and Welfare, reporting directly to the Assistant Secretary for Education.

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[2]All quotes are from the Commission on Instructional Technology, *To Improve Learning*, 1970.

> "The National Institutes of Education should be broadly authorized to develop, support, and fund greatly strengthened programs in educational research, development, and application (R.D.&A.).
>
> "The National Institutes of Education should comprise several constituent institutes, through which grants would be made to universities and other independent research institutions. The institutes would also conduct research themselves. The NIE should sponsor, among other things, several strong autonomous regional R.D.&A. centers, plus a small number of comprehensive demonstration projects."

In expanding on this recommendation, the Commission noted, "The National Institutes of Education and its component institutes would undertake a limited amount of research, development, and application themselves. This proportion should be relatively small, however--perhaps 10 to 15 percent. The majority of the work should be executed through grants made by the institutes to selected institutions, both public and private.

"The National Institutes of Education should be headed by a director with outstanding qualifications appointed by the President and aided in policy making by a small strong top-level Advisory Board, composed of government and non-government representatives. Each constituent institute should also be headed by a highly qualified director. Together the Advisory Board and the directors would act as a council to coordinate the work of the NIE.

"The National Institutes of Education should also be expected to maintain close ties with relevant research and development being conducted in the many federal agencies outside the Department of Health, Education and Welfare that operate education programs; also with the American Educational Research Association and with practitioners in other relevant disciplines such as social scientists and engineers.

"The National Institutes of Education could use the research models in agriculture and health as guides. In its disposition of research funds, for instance, the NIE might well follow the lead of the National Institutes of Health in concentrating research in universities and other research-oriented institutions through grants. In other important matters, however, agricultural research and development might offer a more appropriate model; e.g., with respect to the close cooperation maintained with

state and local agencies and the emphasis on development and application as well as basic research.

"The National Institutes of Education proposed in this report may well be involved in research projects running three to five years or more in length. Annual funding in the ordinary way would limit the effectiveness of such projects. The new organization, therefore, should explore with the Bureau of the Budget the possibility of obtaining authority to use 'no-year appropriations' for research programs, or forward funding arrangements (100 percent committed for the first year, two-thirds for the second year, and one-third for the third year) similar to those developed by a number of government agencies including the National Science Foundation, the Atomic Energy Commission, the Environmental Science Services Administration, the National Aeronautics and Space Administration, and the Department of Defense."

Recommendation No. 2

> "A National Institute of Instructional Technology (NIIT) should be established as a constituent of the proposed National Institutes of Education. The purpose of the NIIT should be to improve American education at all levels through the use of instructional technology. The focus of the Institute's activities should be on research, development, and application in equipment, instructional materials, and systems, and also in training personnel.
>
> "The proposed National Institute of Instructional Technology should strengthen and promote the most promising of the Research and Development Centers and Regional Educational Laboratories (now operating under Title IV of the Elementary and Secondary Education Act of 1965) which are conducting programs involving instructional technology, and should establish such other regional centers as it deems necessary."

"Like its fellow institutes, the National Institute of Instructional Technology could be a new locus of talent, energy, expertise, and imagination for American education, providing leadership and initiative for efforts from many sources. It should bring together scholars from many disciplines and experts from the various media representing divergent viewpoints, including talented people who have hitherto dedicated themselves primarily to their own professional fields and organizations and to their own communities and institutions.

"The Commission cannot emphasize too strongly the importance of 'a diversity of approaches.' The National Institutes of Education and its constituent institutes should constantly foster *alternative* schemes, in much the same way as systems analysis encourages alternative solutions to an objective that has been established. The problems of education will not be solved by any one approach. The very diversity of human beings and cultural patterns demand diverse approaches. In the past, education has tended to overlook this diversity and has been inclined to proceed on the assumption that everyone should be able to learn in much the same way. We propose, therefore, a decentralized pattern for the programs sponsored and coordinated by the National Institute of Instructional Technology, and we envisage regional clusters of institutions--universities, school systems, state departments of education, production centers--working together on projects of common interest and of national significance.

"The Commission has concluded that only the federal government can undertake the major responsibility for the expenditures for basic and applied research, development, and application required in the years immediately ahead. Furthermore, we believe that the minimum initial financing required to carry out the recommendations of this report is approximately $565 million. Of this about $150 million would be required to launch the National Institutes of Education and the National Institute of Instructional Technology. The remaining $415 million would be required for the first full year of operation, including approximately $250 million for the research, development, and application activities of the institutes, $25 million for the center or 'library' of educational resources, $100 million for demonstration projects, and $40 million for the training of personnel. The aggregate amount suggested would equal no more than 1 percent of the projected total expenditures for American education in fiscal 1972.

"This proposed budget, it should be noted, includes the present research activities of the U.S. Office of Education; it is, however, an *addition* to other authorizations for education programs by government and private agencies."

Appendix B

QUESTIONS ASKED DURING PLANNING STUDY

I. Objectives

1. Should the Institute be concerned with all levels and kinds of education? Which ones should receive special emphasis?

2. At what stage in the planning cycle of research, development, demonstration, and dissemination should the Institute's responsibility stop?

3. Should the Institute play a coordinative role for educational research and development sponsored by other Federal agencies?

4. Should the Institute respond directly to guidance provided by state and local education agencies? More generally, what clientele should it serve?

5. Should the Institute have special responsibility for the proper growth of the educational research and development community through, for example, training and institution-building activities?

6. Should the Institute focus its efforts principally on short-term responses to urgent problems of education or on longer-term knowledge-building to provide the base for more effective problem-solving later? More generally, what balance should be sought between these two goals?

7. Should the Institute's intramural research program attempt to satisfy certain special needs or should it be distinguished chiefly by size and quality?

II. Research and Development Program

One set of questions of great importance concerns the topics that the Institute should address and the methods for determining, reviewing, and evaluating those choices.

1. What should the Institute's major research themes be?

2. How should the Institute's effort be distributed among the various age levels, populations, and purposes of education?

3. How should the Institute's effort be divided between research and development?

4. How should the Institute's effort be divided between intramural and extramural research?

5. How should the Institute's effort be divided between short-range and long-range research?

6. How should the Institute's effort be divided among the problems faced by Federal, state, and local education agencies?

7. How should the Institute's effort be divided among the several education-relevant disciplines?

A second set of questions concerns the mechanisms by which the Institute establishes its initial priorities and continually reviews and revises them.

1. How should resource allocations and project choices be made? How should the resultant research or development activity be reviewed? What forms of outside assistance should be employed?

2. Do the answers to these questions differ for intramural and extramural research?

A third set of questions concerns activities that support and extend educational research and development.

1. To what extent should the Institute support the training of educational research and development personnel? Should it perform training activities itself? What means should it use to support training programs?

2. To what extent should the Institute engage in dissemination activities? Of what kinds? Performed by whom?

3. To what extent should the Institute support the establishment of research or problem-solving activities within other Federal, state, or local educational agencies?

III. Organization and Structure

1. What should the internal organization of the Institute be?

2. What mechanisms should be established to assure appropriate interactions between the Institute's program and the research community?

3. What conditions must be satisfied in order to attract to the Institute the very highest quality educational researchers, developers, and administrators? How should their performance be evaluated and rewarded? To what extent should the staff be short-term? To what extent permanent? How large should the research staff be? What disciplines should it include?

IV. Relations Between NIE and the Educational System

1. How should the NIE relate to the operating bureaus of the Office of Education and the other Federal departments and agencies that support education and education-related activities?

2. How should the NIE relate to the variety of state agencies--from departments of education to state university systems--that affect educational operations?

3. How should the NIE relate to the operating sector--local school districts, schools, universities, colleges--of the educational system?

4. How should the NIE relate to other supporters of educational research and development--other government organizations, foundations, the education-products industry, educational associations, education-school endowments?

5. How should the NIE relate to other producers of educational research and development--Regional Laboratories, Research and Development centers, the National Center for Educational Statistics, academic institutions, state and local research bureaus, education-products firms, and nonprofit research institutions?

6. How should the NIE relate to the variety of professional and educational associations?

V. Initial Activities

1. How rapidly should the Institute grow in dollars, personnel, programs?

2. What should its initial program comprise? How should the projects be chosen so as to assure an effective beginning for the Institute?

Appendix C

INDIVIDUALS AND ORGANIZATIONS CONSULTED DURING PRELIMINARY PLANNING FOR THE NATIONAL INSTITUTE OF EDUCATION

List of Persons Consulted[1]

Ambach, Gordon M.
Executive Deputy Commissioner
The State Education Department
Albany, New York

Anderson, Scarvia B.
Executive Director for
Special Development
Educational Testing Service
Princeton, New Jersey

Atkin, J. Myron
Dean, College of Education
University of Illinois
Urbana, Illinois

Barrows, Thomas S.
Executive Associate
Educational Testing Service
Princeton, New Jersey

Baratz, Stephen
National Academy of Sciences
Washington, D.C.

Bateman, Worth
Vice President
Urban Institute
Washington, D.C.

Beberman, Max
Director
Curriculum Laboratory
University of Illinois
Urbana, Illinois

Becker, James W.
Executive Director
Research for Better Schools
Incorporated
Philadelphia, Pennsylvania

Begle, E. G.
Director, School Mathematics
Study Group
Stanford University
Palo Alto, California

Bellack, Arno A.
Teachers College
Columbia University
New York, New York

Berke, Joel
SURC Policy Institute
Syracuse, New York

Bevan, William
Vice President and Provost
The Johns Hopkins University
Baltimore, Maryland

Blake, Elias, Jr.
President
Institute for Services to
Education
Washington, D.C.

Boozer, Howard R.
Director, Educational
Development Administration
Radio Corporation of America
Camden, New Jersey

Bower, Joseph
Harvard Business School
Cambridge, Massachusetts

Brickell, Henry M.
Institute for Educational
Development
New York, New York

---

[1]Affiliations listed are those held at the time of consultation.

Brodsky, David J.
Vice President
Educational Testing Service
Princeton, New Jersey

Burkett, Lowell
Executive Secretary
American Vocational Association
Washington, D.C.

Caffrey, John
American Council on Education
Washington, D.C.

Campbell, Paul B.
Director, Office of
Research and Statistics
Department of Education
Harrisburg, Pennsylvania

Cannon, William
Vice President
University of Chicago
Chicago, Illinois

Chauncey, Henry
President
Interuniversity Communications
Council, Incorporated
Princeton, New Jersey

Chinitz, Benjamin
Economics Department
Brown University
Providence, Rhode Island

Cohen, David K.
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Cohen, Elizabeth G.
School of Education
Stanford University
Palo Alto, California

Comitas, Lambros
Teachers College
Columbia University
New York, New York

Conner, Forrest E.
Executive Secretary
American Association of
School Administrators
Washington, D.C.

Crozier, Michel
Department of Social Relations
Harvard University
Cambridge, Massachusetts

Cremin, Lawrence
Teachers College
Columbia University
New York, New York

Cronbach, Lee J.
School of Education
Stanford University
Palo Alto, California

Cunningham, Luvern L.
Dean, College of Education
Ohio State University
Columbus, Ohio

Dafoe, Don M.
Executive Secretary
Council of Chief State School
Officers
Washington, D.C.

Davis, John B.
Superintendent of Schools
Minneapolis, Minnesota

Davis, Lloyd
Special Assistant
Science and Education
Department of Agriculture
Washington, D.C.

Davis, Richard H.
Dean, School of Education
University of Wisconsin--Milwaukee
Milwaukee, Wisconsin

Davis, Robert
Director,
Madison Project
Syracuse University
Syracuse, New York

Dees, Bowen
President
Franklin Institute
Philadelphia, Pennsylvania

De Mott, Benjamin
Department of English
Amherst College
Amherst, Massachusetts

Derr, C. Brooklyn
The Center for the Advanced
Study of Educational
Administration
The University of Oregon
Eugene, Oregon

Dershimer, Richard A.
Executive Officer
American Educational Research
Association
Washington, D.C.

Dror, Yehezkel
The Rand Corporation
New York, New York

Dunham, E. Alden
Executive Associate
Carnegie Corporation
New York, New York

Dyer, Henry S.
Vice President
Educational Testing Service
Princeton, New Jersey

Engler, David
Vice President
McGraw-Hill Publishing
Company
New York, New York

Feldmesser, Robert A.
Research Sociologist
Educational Testing Service
New York, New York

Fisher, John H.
Modern Language Association
of America
New York, New York

Forkner, Hamden L.
Professor Emeritus of
Education
Teachers College
Columbia University
New York, New York

Gage, N. L.
School of Education
Stanford University
Palo Alto, California

Glaser, Robert
University of Pittsburgh
Pittsburgh, Pennsylvania

Glass, Gene V.
Laboratory of Educational Research
University of Colorado
Boulder, Colorado

Gleason, Andrew M.
Chairman
Department of Mathematics
Harvard University
Cambridge, Massachusetts

Golden, William
Curriculum Laboratory
University of Illinois
Urbana, Illinois

Goslin, David A.
Russell Sage Foundation
New York, New York

Grobman, Arnold B.
Dean, Rutgers College
New Brunswick, New Jersey

Halperin, Samuel
Educational Staff Seminar
Washington, D.C.

Hansen, W. Lee
Department of Economics
University of Wisconsin
Madison, Wisconsin

Hartman, Robert
Brookings Institution
Washington, D.C.

Hemphill, John
Director
Far West Regional Laboratory
for Educational Research and
Development
Berkeley, California

Hind, Robert R.
President
Educational Development
Center, Incorporated
Cambridge, Massachusetts

Huitt, Ralph
Executive Director
National Association of State
Universities and Land-Grant
Colleges
Washington, D.C.

Irby, Alice J.
Executive Director for
Program Development
Educational Testing Service
Princeton, New Jersey

James, H. Thomas
Dean, School of Education
Stanford University
Palo Alto, California

Jarrett James L.
Associate Dean
School of Education
University of California
Berkeley, California

Kahl, William
Superintendent of Public
Instruction
State Department of Public
Instruction
Madison, Wisconsin

Karplus, Robert
Department of Physics
University of California
Berkeley, California

Kelly, James
Ford Foundation
New York, New York

Kerlinger, Fred N.
School of Education
New York University
New York, New York

Kershaw, Joseph A.
Department of Economics
Williams College
Williamstown, Massachusetts

Killian, James R., Jr.
Chairman of the Corporation
Massachusetts Institute of
Technology
Cambridge, Massachusetts

Koob, Reverend C. Albert
Executive Secretary
National Catholic Education
Association
Washington, D.C.

Komoski, Kenneth
Director, Education Products
Information Exchange
New York, New York

Kopstein, Felix
HumRRO
Alexandria, Virginia

Krathwohl, David R.
Dean, College of Education
Syracuse University
Syracuse, New York

Lambert, Samuel
Executive Secretary
National Education Association
Washington, D.C.

Levin, Henry
School of Education
Stanford University
Palo Alto, California

Levine, Richard S.
Vice President
Educational Testing Service
Princeton, New Jersey

Lipson, Joseph
Learning Research Associates,
Incorporated
New York, New York

Little, Kenneth R.
Executive Officer
American Psychological Association
Washington, D.C.

Locke, Robert W.
Executive Vice President
McGraw-Hill Publishing Company
New York, New York

Long, Herman H.
President
Talladega College
Talladega, Alabama

Lorsch, Jay
Harvard Business School
Cambridge, Massachusetts

Lumley, John
National Education Association
Washington, D.C.

MacLeod, Colin M.
School of Medicine
New York University
New York, New York

Mars, Walter
American Association of Colleges of Teacher Education
Washington, D.C.

McBride, Katherine
President Emerita
Bryn Mawr College
Bryn Mawr, Pennsylvania

McPherson, R. Bruce
Associate Superintendent for Policy Planning and Development
School District of Philadelphia
Philadelphia, Pennsylvania

Marburger, Carl
Commissioner of Education
State Department of Education
Trenton, New Jersey

Marquis, Donald
Sloan School of Management
Massachusetts Institute of Technology
Cambridge, Massachusetts

Messick, Samuel
Vice President for Research
Educational Testing Service
Princeton, New Jersey

Miller, George A.
Department of Psychology
Rockefeller University
New York, New York

Nyquist, Ewald
Commissioner of Education
State Education Department
Albany, New York

Page, J. Boyd
President
The Council of Graduate Schools in the United States
Washington, D.C.

Parker, Thomas D.
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Parnell, Dale
Superintendent of Public Instruction
State Board of Education
Salem, Oregon

Phillips, William
Director, Office of Research and Development
Department of Education
Trenton, New Jersey

Pierce, Wendell
Executive Director
Education Commission of the States
Denver, Colorado

Pollak, Henry O.
Director, Mathematics Research Center
Bell Laboratories
Murray Hill, New Jersey

Pullen, Thomas
Former Superintendent of Schools
Baltimore, Maryland

Reeves, William
Department of Sociology
Stanford University
Palo Alto, California

Rettig, Richard A.
Graduate School of Business and
Public Affairs
Cornell University
Ithaca, New York

Rice, Statton
Director
Instructional Resources
State University of New York
Albany, New York

Rivlin, Alice
The Brookings Institution
Washington, D.C.

Robinson, David A.
Vice President
The Carnegie Corporation
New York, New York

Robinson, Glen
National Education Association
Washington, D.C.

Rosenbloom, Richard
Harvard Business School
Cambridge, Massachusetts

Ross, Sherman
Executive Director, Committee on
Basic Research in Education
National Research Council
Washington, D.C.

Schwartz, Judah
Education Research Center
Massachusetts Institute of
Technology
Cambridge, Massachusetts

Schwebel, Milton
Dean, Graduate School of
Education
Rutgers University
New Brunswick, New Jersey

Seidel, Robert J.
HumRRO
Alexandria, Virginia

Sheldon, Eleanor
Russell Sage Foundation
New York, New York

Silberman, Harry
System Development Corporation
Santa Monica, California

Simms, Albert G.
Vice President
College Entrance Examination
Board
New York, New York

Sizer, Theodore R.
Dean, Graduate School of Education
Harvard University
Cambridge, Massachusetts

Smith, Mark
American Association of Colleges
of Teacher Education
Washington, D.C.

Solomon, Robert J.
Executive Vice President
Educational Testing Service
Princeton, New Jersey

Stake, Robert E.
College of Education
University of Illinois
Urbana, Illinois

Steinbach, Sheldon E.
American Council on Education
Washington, D.C.

Steinhilber, August W.
National School Boards Association
Washington, D.C.

Stone, C. Sumner
Director
Educational Opportunity Projects
Educational Testing Service
Princeton, New Jersey

Sullivan, J. Graham
Deputy Superintendent of Schools
Los Angeles City Schools
Los Angeles, California

Taylor, Donald W.
Dean, Graduate School
Yale University
New Haven, Connecticut

Thomas, Ronald B.
Director
College Music Curriculum
Development Program
Manhattanville College
Tarrytown, New York

Trow, Martin
Professor of Sociology
University of California
Berkeley, California

Tucker, Mark
Secretary, Education
Development Center
Incorporated
Cambridge, Massachusetts

Tukey, John W.
Department of Statistics,
Princeton University
Princeton, New Jersey

Tumin, Melvin M.
Department of Sociology and
Anthropology
Princeton University
Princeton, New Jersey

Turnbull, William W.
President
Educational Testing
Service
Princeton, New Jersey

Tyler, Ralph W.
Director Emeritus,
Center for Advanced Study in the
Behavioral Sciences
Stanford, California

Ward, Paul
American Historical Association
Washington, D.C.

Westheimer, Frank H.
Department of Chemistry
Harvard University
Cambridge, Massachusetts

White, Sheldon
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Whittier, C. Taylor
Commissioner of Education
Department of Education
Topeka, Kansas

Wiesner, Jerome B.
Provost
Massachusetts Institute of
Technology
Cambridge, Massachusetts

Wilhelms, Fred T.
Executive Secretary
Association for Supervision
and Curriculum Development
Washington, D.C.

Williamson, H.
American Economic Association
Evanston, Illinois

Wright, Stephen J.
Vice President,
College Entrance Examination
Board
New York, New York

Zacharias, Jerrold R.
Director, Education Research
Center
Massachusetts Institute of
Technology
Cambridge, Massachusetts

List of Formal Meetings Held on NIE Planning

1. *NIE Planning Conference*, July 6 & 7, 1970, Cambridge, Mass. (This meeting was organized by Prof. J. Zacharias and Dean T. Sizer and sponsored by the Sloan Foundation. NIE Planning Staff members were in attendance.)

2. *NIE Program Planning Conference*, August 3 & 4, 1970, Washington, D.C.

3. *NIE Organization Planning Conference*, August 17 & 18, 1970, Washington, D.C.

4. *NIE Planning Conference*, August 27 & 28, 1970, Stanford, California. (This meeting was organized by Prof. L. Cremin and Dean H. T. James and sponsored by the NIE Planning Study.)

5. *NIE Planning Conference*, September 2, 1970, Princeton, New Jersey. (This meeting was organized by Vice President R. Solomon of the Educational Testing Service and sponsored by ETS and the NIE Planning Study.)

Groups to Whom Presentations Were Made

Regional Educational Laboratories and Research and Development Centers Directors Meeting, June 5-8, at Denver.

Commissioner's Conference of Chief State School Officers, June 18, 1970.

Carnegie Commission on Higher Education, June 26, 1970.

President's Science Advisory Committee (Education Panel), July 2, 1970.

American Educational Research Association (Sponsored Meeting of Discipline Groups), July 29, 1970.

American Association of Colleges of Teacher Education, School for Executives, August 20, 1970.

Subcommittee of Chief State School Officers, August 21, 1970.

EDUCOM (Interuniversity Communications Council, Inc.), October 15, 1970.

Association of Schools and Colleges of Education in State Universities and Land-Grant Colleges, October 26, 1970.

Federal Government Agencies Consulted

Interviews have been held with officials in the following agencies:

White House

Executive Office of the President
Office of Science and Technology
Office of Management and Budget

Office of the Secretary, HEW
Office of the Assistant Secretary for Planning and Evaluation

Office of Education
All major bureaus; National Center for Educational Research and Development; Deputy Assistant Secretary for Planning, Research, and Evaluation; National Center for Educational Communication; National Center for Educational Statistics.

National Institutes of Health
Office of the Director
National Institute of Dental Research
National Institute of Arthritis and Metabolic Diseases

Office of Economic Opportunity
Office of the Assistant Director for Planning, Research, and Evaluation

National Science Foundation
Office of Assistant Director for Education
Office of Assistant Director for Institutional Programs

National Bureau of Standards

List of Persons Providing Written Comments on Draft Plan[2]

Adrian, William
Assistant to the Chancellor
University of Denver
University Park, Colorado

Allen, James E., Jr.
The Woodrow Wilson School of
Public and International Affairs
Princeton, New Jersey

Anderson, Scarvia B.
Executive Director for Special
Development
Educational Testing Service
Princeton, New Jersey

Anrig, Gregory R.
University of Massachusetts
Boston, Massachusetts

Armamentos, Robert G.
Educational Facilities Corporation
Chicago, Illinois

Arnstein, George E.
National Science Foundation
Washington, D.C.

Astin, Alexander W.
Director, Office of Research
American Council on Education
Washington, D.C.

[2]Affiliations listed are those held at time of correspondence.

Bain, Helen P.
President
National Education Association
Washington, D.C.

Balakrishnan, A. V.
School of Engineering and
Applied Science, UCLA
Los Angeles, California

Beberman, Max
Director, Curriculum Laboratory
University of Illinois
Urbana, Illinois

Becker, James W.
Executive Director
Research for Better Schools,
Incorporated
Philadelphia, Pennsylvania

Begle, E. G.
Director, School Mathematics
Study Group
School of Education
Stanford University
Palo Alto, California

Boerrigter, Glenn C.
Director, Division of Elementary
and Secondary Education Research,
NCERD
Office of Education, D.H.E.W.
Washington, D.C.

Briggs, Thomas H.
Meredith, New Hampshire

Booth, Alan
Director, Bureau of Sociological
Research
State Department of Education
Lincoln, Nebraska

Burchinal, Lee G.
Assistant Commissioner
National Center for Educational
Communication
Office of Education, D.H.E.W.
Washington, D.C.

Burns, Thomas J.
Acting Associate Commissioner for
Elementary and Secondary Education
Office of Education, D.H.E.W.
Washington, D.C.

Butler, Wendell P.
Superintendent of Public Instruction
Department of Education
Commonwealth of Kentucky
Frankfurt, Kentucky

Caldwell, Bettye M.
Director, Center for Early Develop-
ment and Education
College of Education
University of Arkansas
Little Rock, Arkansas

Campbell, Ernest O.
Department of Sociology and
Anthropology
Vanderbilt University
Nashville, Tennessee

Campbell, Paul B.
Director, Office of Educational
Research and Statistics
State Department of Education
Harrisburg, Pennsylvania

Cannon, William B.
Vice President, Programs and
Projects
The University of Chicago
Chicago, Illinois

Carmichael, Benjamin E.
Director
Appalachia Educational Laboratory
Charleston, West Virginia

Carpenter, C. R.
Department of Psychology
The University of Georgia
Athens, Georgia

Carter, Launor F.
Vice President, Public Systems
Division
System Development Corporation
Santa Monica, California

Chadwick, Ruth E.
Principal
The Horace Mann School
Newtonville, Massachusetts

Chall, Jeanne
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Chase, Francis S.
Southwest Educational Development Laboratory
Austin, Texas

Christian, Floyd T.
Commissioner
State Department of Education
Tallahassee, Florida

Clark, David
Dean, University of Indiana
Bloomington, Indiana

Clemens, Thomas
National Center for Educational Communication
Office of Education, D.H.E.W.
Washington, D.C.

Cohen, David K.
Center for Educational Policy Research
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Colgan, Francis
Coordinator, Planning, Research and Evaluation
State Department of Education
Lincoln, Nebraska

Comer, James P., M.D.
Yale Child Study Center
Yale Medical School
New Haven, Connecticut

Davis, Robert B.
Director, The Madison Project
Syracuse University
Syracuse, New York

Demerath, Jay
The American Sociological Association
Washington, D.C.

DeMott, Benjamin
Department of English
Amherst College
Amherst, Massachusetts

Derr, C. Brooklyn
The Center for the Advanced Study of Educational Administration
The University of Oregon
Eugene, Oregon

Dershimer, Richard A.
American Education Research Association
Washington, D.C.

Eager, George B.
International Council for Educational Development
New York, New York

Eagon, Burdette
Associate Vice President for Academic Affairs
Wisconsin State University
Stevens Point, Wisconsin

Eibling, Harold H.
Superintendent of Schools
Columbus Public Schools
Columbus, Ohio

Elmore, Harry
Deputy Superintendent
State Department of Education
Richmond, Virginia

Ellis, Robert A.
Vice President, Educational Services Division
General Learning Corporation
Washington, D.C.

Endicott, Kenneth M., M.D.
Director, Bureau of Health Manpower Education, Public Health Service
National Institutes of Health
Bethesda, Maryland

Engelking, D. F.
Superintendent of Public Instruction
State Department of Education
Boise, Idaho

Essex, Martin
Superintendent of Public Instruction
State Department of Education
Columbus, Ohio

Evers, Nathaniel H.
Dean, Graduate School of Arts and Sciences
University of Denver
University Park, Colorado

Fels, Rendigs
American Economic Association
Nashville, Tennessee

Finn, Chester E., Jr.
The White House
Washington, D.C.

Firman, William D.
Assistant Commissioner for Research and Evaluation
The State Education Department
Albany, New York

Fish, Lawrence D.
Northwest Regional Educational Laboratory
Portland, Oregon

Fisher, John H.
Modern Language Association of America
New York, New York

Furno, Orlando F.
Research Staff
Baltimore City Public Schools
Baltimore, Maryland

Gagne, Robert M.
President, American Educational Research Association
Washington, D.C.

Gallagher, James J.
Director, Frank Porter Graham Child Development Center
The University of North Carolina
Chapel Hill, North Carolina

Geissinger, John B.
President, Elect
American Association of School Administrators
Washington, D.C.

Gideonse, Hendrik D.
Director, Program Planning and Evaluation, NCERD
Office of Education, D.H.E.W.
Washington, D.C.

Glaser, Robert
Director, Learning Research and Development Center
University of Pittsburgh
Pittsburgh, Pennsylvania

Glass, Gene V.
Editor, Review of Educational Research
Laboratory of Educational Research
University of Colorado
Boulder, Colorado

Godbey, Gordon C.
Assistant Dean for Continuing Education
College of Education
Pennsylvania State University
University Park, Pennsylvania

Goldhammer, Keith
Dean, College of Education
Oregon State University
Eugene, Oregon

Goslin, David A.
Russell Sage Foundation
New York, New York

Grether, Clara E.
Research Staff
Baltimore City Public Schools
Baltimore, Maryland

Griffiths, Daniel
Dean, School of Education
New York University
New York, New York

Guba, Egon
Associate Dean, Academic Affairs
School of Education
Indiana University
Bloomington, Indiana

Hall, Newman A.
National Academy of Engineering
Washington, D.C.

Hamblen, John W.
Project Director, Computer Sciences
Southern Regional Education Board
Atlanta, Georgia

Handler, Philip
President
National Academy of Sciences
Washington, D.C.

Hansen, W. Lee
Department of Economics
The University of Wisconsin
Madison, Wisconsin

Hartman, Robert W.
Research Associate
The Brookings Institution
Washington, D.C.

Hemphill, John K.
Laboratory Director
Far West Laboratory for Educational Research and Development
Berkeley, California

Hilgard, Ernest R.
Department of Psychology
Stanford University
Palo Alto, California

Hind, Robert
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Hirsch, Walter
Director, Educational Research
Region IX, U.S.O.E.
San Francisco, California

Hopkins, Everett H.
President, Regional Education
Laboratory for the Carolinas and Virginia
Durham, North Carolina

Humphreys, Lloyd G.
Assistant Director for Education
National Science Foundation
Washington, D.C.

Hunt, J. McVicker
Department of Psychology
University of Illinois
Champaign, Illinois

Ikenberry, Stanley
Pennsylvania State University
University Park, Pennsylvania

Jencks, Christopher
Center for Educational Policy Research
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Kagan, Jerome
Department of Social Relations
Harvard University
Cambridge, Massachusetts

Kahl, William C.
Superintendent of Public Instruction
State Department of Education
Madison, Wisconsin

Keeney, Barnaby C.
Chief Executive Officer
Consortium of Universities
Washington, D.C.

Kelly, Edward J.
College of Education
University of Northern Colorado
Greeley, Colorado

Kerlinger, Fred N.
School of Education
New York University
New York, New York

Kershaw, Joseph A.
Department of Economics
Williams College
Williamstown, Massachusetts

Kessin, William
Department of Psychology
Yale University
New Haven, Connecticut

Killian, J. R., Jr.
Chairman of the Corporation
Massachusetts Institute of Technology
Cambridge, Massachusetts

Koerner, James D.
Alfred P. Sloan Foundation
New York, New York

Kurtzman, David H.
Secretary of Education
State Department of Education
Harrisburg, Pennsylvania

Lawrence, Benjamin
Western Interstate Commission on Higher Education
Boulder, Colorado

Leestma, Robert
Associate Commissioner for International Education, IIS
Office of Education, D.H.E.W.
Washington, D.C.

Lipson, Joseph
Plantation, Florida

Little, Kenneth B.
American Psychological Association
Washington, D.C.

MacLeod, Colin M., M.D.
President
Oklahoma Medical Research Foundation
Oklahoma City, Oklahoma

Madden, Kenneth C.
State Superintendent of Public Instruction
Dover, Delaware

McBride, Katherine
President Emerita of Bryn Mawr College
Bryn Mawr, Pennsylvania

McCaffrey, Austin J.
Vice President
Association of American Publishers, Incorporated
New York, New York

McCarty, Donald J.
Dean, School of Education
University of Wisconsin
Madison, Wisconsin

McMurrin, Sterling M.
Dean, Graduate School
The University of Utah
Salt Lake City, Utah

McPherson, R. Bruce
Associate Superintendent for Policy Planning and Development
School District of Philadelphia
Philadelphia, Pennsylvania

Meierhenry, W. C.
Chairman, Department of Adult and Continuing Education
The University of Nebraska
Lincoln, Nebraska

Mellado, Ramón
Secretary of Education
Department of Education
Hato Rey, Puerto Rico

Miller, George A.
The Institute for Advanced Study
Princeton, New Jersey

Minow, Newton N.
Chairman of the Board
The Rand Corporation
Santa Monica, California

Moore, J. William, Chairman,
Department of Education
Bucknell University
Lewisburg, Pennsylvania

Moss, James W.
Director, Division of Research
Bureau of Education for the Handicapped
Office of Education, D.H.E.W.
Washington, D.C.

Nelson, Richard R.
Economic Growth Center
Yale University
New Haven, Connecticut

Nichols, Alan H.
President, San Francisco Unified School District
San Francisco, California

Nix, Charles W.
Associate Commissioner for Planning
Texas Education Agency
Austin, Texas

Nix, Jack P.
State Superintendent of Schools
State Department of Education
Atlanta, Georgia

Nolan, David M.
Director, Washington Office
Educational Testing Service
Washington, D.C.

Owens, Joseph P.
Chairman, Committee on Studies
American Association of Colleges of Teacher Education
Cleveland, Ohio

Palmer, Edward L.
Vice President and Director of Research
Children's Television Workshop
New York, New York

Parnell, Dale
Superintendent of Public Instruction
State Board of Education
Salem, Oregon

Peper, John B.
Executive Director of Research and Evaluation
School District of Philadelphia
Philadelphia, Pennsylvania

Pierce, Wendell
Executive Director, Education Commission of the States
Denver, Colorado

Pigge, Fred L.
Director, Research and Services
College of Education
Bowling Green State University
Bowling Green, Ohio

Pincus, John
The Rand Corporation
Santa Monica, California

Pollak, Henry O.
Director, Mathematics Research Center
Bell Laboratories
Murray Hill, New Jersey

Popham, W. James
Graduate School of Education
University of California
Los Angeles, California

Porter, John W.
Superintendent of Public Instruction
State Department of Education
Lansing, Michigan

Panel on Educational Research and Development
President's Science Advisory Committee
Washington, D.C.

Price, Mrs. Leon S.
President, National Congress of Parents and Teachers
Chicago, Illinois

Raizen, Senta
Special Assistant to the Assistant Director for Education
National Science Foundation
Washington, D.C.

Reitz, J. Wayne
Director, Division of University Programs
Office of Education, D.H.E.W.
Washington, D.C.

Ross, Sherman
Executive Secretary, Committee
on Basic Research in Education
National Research Council
Washington, D.C.

Rowe, Mary Budd
Teacher's College
Columbia University
New York, New York

Rowen, Henry S.
President
The Rand Corporation
Santa Monica, California

Scriven, Michael
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Selden, David
President
American Federation of Teachers
AFL-CIO
Washington, D.C.

Sensenbaugh, James A.
State Superintendent of Schools
State Department of Education
Baltimore, Maryland

Shedd, Mark R.
Superintendent of Schools
School District of Philadelphia
Philadelphia, Pennsylvania

Sheldon, Eleanor Bernert
Russell Sage Foundation
New York, New York

Shibels, M.
University of Maine
Orono, Maine

Sizer, Theodore R.
Dean, Graduate School of
Education
Harvard University
Cambridge, Massachusetts

Solomon, Robert J.
Executive Vice President
Educational Testing Service
Princeton, New Jersey

Stalcup, John P.
Director, School of Education
University of Denver
University Park, Colorado

Sullivan, Edwin M.
Special Assistant, Office of the
Deputy Assistant Secretary for
Planning, Research, and Evaluation
Office of Education, D.H.E.W.
Washington, D.C.

Swartz, Clifford E.
The Physical Laboratory
State University of New York
Stony Brook, L.I., New York

Taylor, Donald W.
Dean of the Graduate School
Yale University
New Haven, Connecticut

Thomas, Ronald B.
Project Director, College Music
Curriculum Development Project
Marymount College
Tarrytown, New York

Topp, Robert F.
Provost, United States International
University
Elliott Campus
San Diego, California

Trainor, Lynn E. H.
Chairman, The Board of Education
for the Borough of North York
Willowdale, Ontario, Canada

Travers, Robert M. W.
College of Education
Western Michigan University
Kalamazoo, Michigan

Trump, J. Lloyd
Associate Secretary for Research
and Development
The National Association of
Secondary School Principals
Washington, D.C.

Tumin, Melvin
Department of Sociology
Princeton University
Princeton, New Jersey

VanderMeer, A. W.
Dean, College of Education
Pennsylvania State University
University Park, Pennsylvania

Vavrina, Vernon S.
Associate Superintendent,
Curriculum and Instruction
Baltimore City Public Schools
Baltimore, Maryland

Vlaanderen, Russell
Research Director
Education Commission of the
States
Denver, Colorado

Wallace, Richard C., Jr.
Director, Eastern Regional
Institute for Education
Syracuse, New York

Ward, Paul L.
American Historical Association
Washington, D.C.

Westheimer, Frank H.
Department of Chemistry
Harvard University
Cambridge, Massachusetts

White, Sheldon H.
Laboratory of Human Development
Graduate School of Education
Harvard University
Cambridge, Massachusetts

Wise, Helen D.
Vice President, Pennsylvania
State Education Association
Harrisburg, Pennsylvania

Appendix D

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Appendix E

NATURE OF EDUCATIONAL RESEARCH AND DEVELOPMENT

John Wirt

INTRODUCTION

The complex of activities that constitute educational R&D can be characterized in many ways. One commonly used characterization distinguishes four major classes of activity: *research*, *development*, *evaluation*, and *innovation*. Three of these classes--*research*, *development*, and *innovation*--correspond directly to analogous activities in physical science and engineering. The additional class of activities--*evaluation*--acquires importance in education because measurement is technically and philosophically more difficult and important in education than in the usual R&D processes. A listing of these classes and some of their subclasses appears in Table E-1.

RESEARCH

Research is the process of discovering explanations for observed phenomena through identification of the critical variables and the relationships between them. Research that is undertaken in order to answer a question arising from development work, or research whose results might immediately affect a decision in development projects is often called *mission-oriented research*. Research that is not likely to affect development immediately or that is done primarily to add to the store of knowledge is often called *basic research*. Basic research results may alter perceptions and lay the foundation for major educational change, but in themselves they rarely affect current decisions.

EVALUATION

Evaluation is the process of measuring or assessing the degree to which an educational activity reaches its goals; it frequently includes the work of expressing those goals. Evaluation assumes prominence because measurement of effects, which is essential to success in an R&D activity, is much harder to accomplish in education than it is in the physical technologies. Evaluation includes not only measurement of

Table E-1

SUBCATEGORIES OF EDUCATIONAL R&D ACTIVITY

Category	Description	Examples
Research		
Basic research	Conducting basic scientific inquiry.	Molecular, biochemical, and physiological bases of memory. Impact of environmental factors on "disadvantaged" children. Small-group theory.
Mission-oriented research	Resolving a question arising in development or operation.	Factors affecting enrollment in adult education. Optimal sequencing of tasks in teaching language by computer.
Evaluation		
Policy evaluation	Developing information to assist in decision-making.	Distribution of Federal financial aids to universities and students. Incentive structures in educational development markets.
Program evaluation	Comparing the performance of an educational program against intended objectives.	Analysis of ESEA Title I programs. Comparison of reading curricula.
Outcome evaluation	Exploring the merit of an educational product or solution.	Judging the effects of a CAI program for Russian instruction. Measuring the performance of a new secondary school physics curriculum.
Assessment evaluation	Determining the status of participants in the educational system.	Longitudinal study of career patterns. Testing cognitive and emotional status of students.
Development		
Operations development	Inventing a solution to an operational problem.	Algorithm for flexible scheduling. Recommendations for classroom attendance policy. Guidelines for conflict resolution.
Product development	Engineering packages and programs for educational use.	Develop TV math course for preschoolers. Develop program for retraining teachers of new chemistry curriculum.
Innovation		
Dissemination	Informing users about solutions and programs.	Clearinghouse on teaching of foreign languages.
Demonstration	Displaying operating models of developed solutions and products.	Visit classroom where microteaching is under way.
Training	Re-educating practitioners in the use of developed solutions and programs.	Summer institutes for math teachers. Survey course in research techniques for administrators.
Servicing	Nurturing and supporting installed programs and products.	In-service training for users of new anthropology curriculum. Adjustment of program to user needs.

cognitive achievement, but also identification of value changes and influences on the affective domain. Evaluation cannot often be delegated to electronic or mechanical devices in education. Sometimes it is best accomplished by visual observation and subjective analysis.

Evaluation comprises a broad range of activities that are not sharply distinguishable. One possible categorization is into four classes: First, there is *policy evaluation*, which is analysis of strategic alternatives for decision-makers. Generally such work is done at the state and Federal levels of government. Then there is *program evaluation*, which is exploring and measuring the effect of an educational program or programs at the local, state, and national levels. Third, there is *outcome evaluation*, which is the testing and verification of new educational products and solutions. And last, there is *assessment evaluation*, which is measuring the cognitive and emotional status of students and instructors.

DEVELOPMENT

Development is the creative process of inventing new products, systems, or procedures. The developer must rely on intuition and imagination in designing his product but should proceed in a disciplined way by using his store of knowledge, testing his ideas for correctness, and encouraging the criticism of colleagues.

Development has two subcategories: *operations development* and *product development*. Operations development includes activities leading to solutions for managerial problems. Product development includes invention of products for instruction or other educational uses.

INNOVATION

The term *innovation* will be employed for lack of a better one. It stands for the complex of actions involved in interconnecting R&D and practice. The process of innovation is not unique to education, since the same exchange must occur in every activity that seeks improvement through R&D. However, innovation is a bigger problem in education, since both the producers and users of educational knowledge are widely distributed and poorly organized.

Categorization of the parts of the innovation process is more difficult, since constituent activities are less easily isolated than in the other R&D functions. One possible classification is *dissemination, demonstration, training,* and *servicing.* However, the image of one-way transmission presented by this list does not reflect all the essential features of successful innovative activity. Feeding back user needs and problems during the R&D process is very often required for successful utilization of the final product.

INTERRELATIONS BETWEEN CATEGORIES

The impression should not be left that R&D functions can be performed in isolation, or that activity proceeds in a linear order from research to development to innovation. Activity in each function may be stimulated and redirected by problems uncovered during performance of another function, or results in one may enable better performance in another.

A most important interrelationship is the sequential application of research, development, and evaluation phases during the development process. After designing a first try at their solution, a disciplined development team will subject that solution to a rigorous evaluation. Elimination of the deficiencies revealed by evaluation is then attempted through research and/or developmental activity. This process can proceed through many development/evaluation cycles until a successful product is achieved. Experience indicates that more than five years may be required to complete major developmental projects.

NEED FOR EXPERIMENTATION

Strategies for conducting educational R&D are strongly influenced by the nature of the educational process. First, it is very difficult to isolate components of the education system for study in a laboratory. Second, the number of factors affecting performance is so great that samples of a few are not sufficient to draw conclusions about educational processes. As a consequence, large-scale experimentation in real-life settings must be an important part of educational R&D.

Appendix F

PERFORMERS OF EDUCATIONAL RESEARCH AND DEVELOPMENT

John Wirt

INTRODUCTION

Educational R&D is performed in a wide variety of institutional settings, with more than 90 percent of the total effort produced by nonprofit organizations. In addition to universities, the list of nonprofit performers includes research institutes, professional associations, education laboratories, and public school systems.

A list of the institutional settings in which educational R&D is performed appears in Table F-1, along with a few examples that illustrate the range of contributing agencies in each setting. A list for other R&D fields would show similar categories and examples, except for one major difference: the absence of the Federal government from the education list. In education there are no Federal laboratories conducting R&D, as opposed to the situation in the health field, for example, where the intramural program on the Federal level is substantial.

COLLEGES AND UNIVERSITIES

Educational R&D is conducted in universities and colleges under many different organizational arrangements. The most prevalent involves an *individual professor* soliciting support from the university or an external source on a topic-by-topic basis. Another is the *research bureau*, an ongoing team of managers and professionals who service a particular set of clients, and who are given long-term support by those clients. Some of these bureaus are very service-oriented, as they concentrate on data services, testing, and problem solving at the local level. A third organizational arrangement in universities is the *program project*--a temporary group of students and professors drawn together for the purposes of meeting particular contractual objectives. At the present time, curriculum development is being done in this setting. The aforementioned forms are not necessarily found in the schools of education, but may be found in other schools of the university or as independent institutes or centers.

Table F-1

EXAMPLES OF PERFORMERS OF EDUCATIONAL RESEARCH AND DEVELOPMENT[a]

Universities and Colleges; some examples are:
- School of Education, University of Massachusetts
- MINIMAST Project, University of Minnesota
- Bureau of Applied Social Research, Columbia University
- Office for Institutional Research, Wayne State University

Research and Development Centers; some examples are:
- Research and Development Center in Teacher Education, Texas
- Education Policy Research Center, Stanford Research Institute
- Center for Research, Development and Training in Occupational Education, North Carolina State University

State Departments of Education; an example is:
- Department of Public Instruction, Arizona

Local Schools and School Systems; some examples are:
- School District of City of Lincoln, Nebraska
- San Mateo Union High School District, California
- Milwaukee Technical College, Wisconsin

Education Associations; some examples are:
- National Education Association
- American Council on Education
- American Education Research Association

Other Professional, Public, and Welfare Organizations; some examples are:
- National Planning Association, Washington, D. C.
- Association of Research Libraries, Washington, D. C.
- B'nai B'rith, New York
- Archdiocese of San Francisco, California

Education Laboratories; an example is:
- Far West Laboratory for Educational Research and Development, Berkeley, Cal.

Nonprofit Research Institutes; some examples are:
- Educational Testing Service, Princeton, New Jersey
- American Institutes for Research, Palo Alto, California
- Educational Systems Research Institute, Pittsburgh, Pennsylvania
- Institute for Defense Analyses, Arlington, Virginia

Business and Industrial Organizations; some examples are:
- Westinghouse Learning Corporation, New York
- System Development Corporation, Santa Monica, California
- Harcourt, Brace and Jovanovich, New York

[a]Examples shown are drawn at random from *Current Project Information, July 1970*, an ERIC publication.

A fourth organizational form found in universities is the *institutional research office* in administrative units. These offices are engaged in local test and measurement programs and policy-oriented research on matters of importance to the sponsoring institution.

RESEARCH AND DEVELOPMENT CENTERS

A fifth form of organization at the universities is the *research and development center*, financed by the OE to overcome deficiencies in the educational R&D system. The primary role of these centers is to conduct interdisciplinary, programmatic R&D. There is more emphasis on research than on development in the R&D centers. Effort is made to focus research efforts for cumulative effects and to concentrate on problems that affect education generally.

EDUCATION LABORATORIES

The *education laboratories* are independent, nonprofit organizations, financed initially by the OE, but with some support from consortia of educational interests. In general, the laboratories are intended to develop solutions to education problems, and to serve as organizers of education development capability. Emphasis is placed on developing usable products and money is spent on diffusion activities. Some laboratories concentrate on solving regional education problems.

STATE DEPARTMENTS OF EDUCATION AND LOCAL SCHOOL SYSTEMS

As a complement to provision of educational services, some local and state administrative units collect data, administer test programs, produce films and curriculum revisions, evaluate state and local programs, and prepare plans for allocating resources. The R&D effort is almost always directed to an immediate operating problem.

EDUCATION AND OTHER PROFESSIONAL, PUBLIC, AND WELFARE ASSOCIATIONS

Many professional and other associations conduct educational R&D. These associations collect, publish, and analyze data; evaluate

educational policies and programs; and hold training sessions for researchers. The range of participating organizations is very broad, as the examples in Table F-1 illustrate.

NONPROFIT RESEARCH INSTITUTES

In addition to the nonprofit agencies already listed, another category of such agencies is involved in educational R&D: nonprofit corporations and research institutes. Some, such as the Educational Testing Service, sponsor in-house research; but contract research for a wide assortment of clients predominates.

BUSINESS AND INDUSTRIAL ORGANIZATIONS

In the profit-making sector, R&D activity is concentrated in the textbook and curriculum publishing business. As few numbers are quoted in public documents, the scale of activity in this sector is imprecisely known, but it probably accounts for only a small fraction of the total national R&D activity. Consulting firms and system analysis firms are in this category of organization.

Appendix G

A COMPARISON OF RESEARCH AND DEVELOPMENT IN AGRICULTURE, EDUCATION, AND HEALTH

John Wirt

This appendix summarizes an analysis comparing the effort devoted to R&D in education with that devoted to R&D in health and agriculture. It shows that in terms of both absolute level of R&D effort and R&D effort as a percentage of sector contribution to GNP, education is considerably less well supported than health or agriculture. The analysis itself will be published in a forthcoming report.

The comparatively low level of educational R&D may be seen by examining four different pictures for each sector for FY 1968:

1. The *man-years* of research, development, and innovation activity *performed* in each of the possible institutional settings;

2. The *dollars* of R&D expenditure in each of the institutional settings;

3. The *dollars* of research, development, and innovation *sponsored* by each of the institutional sources; and

4. The contribution to GNP in each sector.

Some of these pictures are also drawn for FY 1965 to show the impact that the Elementary and Secondary Education Act of 1965 has had on educational R&D.

Specifically, it can be concluded that in FY 1968 (see Table G-1):

1. The contribution to GNP was roughly the same in each field;

2. No more than one-fourth as many dollars were spent on *research* in education as in health or agriculture; and

3. No more than one-fifth as many dollars were spent on *development* in education as in health or agriculture.

As Table G-2 shows, the ratio of development to research sponsorship is higher in education (0.88) than in health (0.66), but lower than in agriculture and the economy as a whole (1.74). The emphasis on development in education is a recent phenomenon, however, since before the passage of the Elementary and Secondary Education Act in 1965, the ratio of development to research expenditures was much lower (0.31). The comparison of R&D funds by a sponsoring institution (see Table G-3)

Table G-1

RESEARCH AND DEVELOPMENT ACTIVITY IN AGRICULTURE, EDUCATION, AND HEALTH

Sector	Sector National Product ($ billions)	FY 1965 Sponsorship[a] ($ millions)			FY 1968 Sponsorship[a] ($ millions)		
		R	D	I	R	D	I
Agriculture	73.5	355	385	200	379	413	241
Education	53.0	70	30	50	90	79	65
Health	51.5	1,086	724	(b)	1,446	949	(b)

[a]R = research; D = development; I = innovation.

[b]No activity explicitly devoted to innovation was identified.

Table G-2

RATIO OF DEVELOPMENT SPONSORSHIP TO RESEARCH SPONSORSHIP, FY 1968

Sector	Sponsorship ($ millions)		Ratio of Development to Research
	Research	Development	
Education	90	79	0.88
Health	1,446	949	0.66
Agriculture	379	413	1.09
All sectors	10,000	17,400	1.74

Table G-3

SOURCES OF RESEARCH AND DEVELOPMENT FUNDS, FY 1968

Sector	Federal Government	State & Local	All Other	Federal Percent of Total	Government[a] Percent of Total
Education	150	3	17	88	90
Health	1,526	69	801	64	67
Agriculture	209	109	460	26	42
All sectors	15,000	500	11,900	55	57

[a]Federal, state, and local governments.

shows that education is very different from other R&D activities in that the Federal government supplies 88 percent of the education R&D funds. In the health field, government supplies 67 percent of the R&D funds; and in agriculture, 42 percent. At the national level, 57 percent of the R&D funds for all sectors are supplied by government.

A comparison of R&D communities by performing institutions produces equally striking differences. Education is unlike health, agriculture, and the economy as a whole in that neither the Federal government nor industry performs much of the R&D in the sector (see Table G-4). In all other sectors, at least 13 percent of the R&D dollars are consumed by the Federal government, and at least 29 percent by industry. Another difference is that in education, 57 percent of the R&D dollars are spent at colleges and universities, while in health the figure is 37 percent, and in agriculture, 22 percent.

Table G-4

EXPENDITURE OF RESEARCH AND DEVELOPMENT FUNDS,
BY PERFORMER, FY 1968
($ millions)

Sector	Universities & Colleges		Federal Government		Industry		All Other		Total
	Exp.	% of Total	Exp.	% of Total	Exp.	% of Total	Exp.	% of Total	
Education[a]	113	60	2	1	8	4	65	35	188
Health	875	37	362	15	695	29	464	19	2,396
Agriculture	174	22	156	20	460	58	...	..	792
All sectors	3,400	12	3,600	13	19,250	70	1,100	4	27,350

[a]Includes some innovation expenditures ($17 million), mostly by universities and colleges.

Table G-5 shows the amount of research, development, and innovation performed by institutions in FY 1968, in man-years of effort. Note that while 15,000 man-years of effort were devoted to specific innovation activities in agriculture, only 1,296 man-years were applied in education. No separately identifiable innovation effort was found in health.

Table G-5

RESEARCH, DEVELOPMENT, AND INNOVATION EFFORTS, FY 1968
(Man-years)

Activity	Federal Laboratory	Colleges & Universities	State & Local Agencies	Nonprofit Institutions	Private Firms	Other	Total
Agriculture							
Research	2,090	2,360	...	(a)	7,950	...	12,400
Development	2,230	3,040	...	(a)	7,950	...	13.220
Innovation	15,000	0	...	...	...	...	15,000
Total	19,320	5,400	...	...	15,900	...	40,620
Education							
Research	...	1,202	465	201	39	26	1,933
Development	...	906	566	801	77	257	2,607
Innovation	...	788	265	125	29	89	1,296
Total	...	2,896	1,296	1,127	145	372	5,836
Health							
Research & Development	10,350	24,900	(b)	9,230	10,690	4,211	58,570

[a]Some activity occurred, but the amount is negligible compared with other entries in agriculture.

[b]Included in entries of other performers.

ERRATA

R-657-HEW, *National Institute of Education: Preliminary Plan for the Proposed Institute*, by Roger E. Levien, February 1971.

1. The List of Persons Providing Written Comments on Draft Plan (pp. 170-178) should include

   Robert Locke
   Executive Vice President
   McGraw-Hill Publishing Company
   New York, New York

2. The following items were inadvertently omitted from the Bibliography (Appendix D):

   Cottrell, Donald P., *National Policy for the Improvement of the Quality of Teacher Education: A Statement by the National Association of Colleges and Schools of Education in State Universities and Land Grant Colleges*, American Association of Colleges for Teacher Education, Washington, D.C., August 1970.

   A National Center for Teacher Education: A Position Statement Prepared by the Committee on National Policy Concerning Teacher Education, Association of Colleges and Schools of Education in State Universities and Land Grant Colleges, February 1971.

COMMUNICATIONS DEPARTMENT

Rand
SANTA MONICA CA 90406